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THE EXPENDITURE ON FORESTS IN INDIA AND ITS RELATION TO THE REVENUE REALISED.

[*Contributed.*]

The relation between the expenditure involved and revenue realised in all business enterprises is always a most important problem, and on its proper solution must to a great extent depend the return realised for capital invested. It is certain that no business which is not supported by sufficient funds can ever pay a proper interest on its capital, whilst on the other hand the over-capitalised concern must always pay a low rate of interest or even fail to pay any at all. The same principles hold in the management of what are known as semi-commercial departments of the Indian Empire, of which the Forest Department is one of the most important. There has been of late a spirit of what we hold to be unwise economy in the management of forest matters for, looking at conservative forest management* from a purely commercial point

* By 'conservative' is meant that the forest stock on the ground, *i. e.*, the capital, is to be kept intact and brought to its highest possible point—the annual yield, *i.e.*, the interest earned by the capital, being alone utilised.

of view, it can be shown, we think, that up to a certain point the more money spent on forest establishment and on means of communication and transport, the greater will be the net revenue per unit of forest worked. What this point may be is as yet uncertain, but it is quite certain that in no province which possesses valuable forest has it yet been reached. Nor can it be reached until every acre of forest is being intensely worked and yielding its highest possible quota to the general revenue. At the present time this is far from being the case; there are enormous areas which are not yet under systematic management, and yielding little or nothing to the revenues of the State. There are also very large areas which are as yet not as intensely worked as they might be, either from insufficient establishment or from lack of communications. In Burma, for instance, over much of the Government forests teak is practically the only forest produce exploited, yet the country is rich in many other valuable woods needing only capital and enterprise to form the source of large and increasing profits. Again in Assam there are also enormous areas which cannot be worked until they are rendered accessible by the construction of roads or tramways. In a word, without further and considerable expenditure the forest revenues of India do not seem likely to expand to any great extent.

As showing the manner in which increased expenditure in the past has been followed by increased revenue, attention may be drawn to Appendix XXII of the Inspector-General of Forests' Review of Forest Administration in British India for the yea 1908-09 in which the forest revenue, expenditure and surplus has been given since the year 1884-85.

The gradual expansion of the forest revenue, expenditure and surplus is shown in the following table :—

	Five years' period.				
	1884-85 to 1888-89.	1889-90 to 1893-94.	1894-95 to 1898-99.	1899-00 to 1903-04.	1904-05 to 1908-09.
	Rs.	Rs.	Rs.	Rs.	Rs.
Average revenue ...	1,16,68,148	1,59,49,015	1,77,15,756	1,96,58,421	2,57,03,161
,, expenditure ...	74,26,956	86,03,351	79,96,140	1,12,69,486	1,41,05,829
,, surplus ...	42,41,192	73,45,664	79,19,616	83,88,935	1,15,97,333
Proportion of expenditure to gross revenue ...	63·7	53·9	55·3	57·3	54·8
Proportion of surplus to gross revenue (per cent)...	36·3	46·0	44·7	42·6	45·1

The annexed interesting diagram traces the rise and fall of forest revenue, expenditure and surplus from 1879-80 to 1909-10, and shows that up to the year 1905-06 there has been a rapid and constant rise in expenditure accompanied by a corresponding rise in revenue and surplus. From time to time falls have taken place which can usually be traced to unfavourable seasons caused by drought, famine, or disease. Thus since 1905-06 there has been a fall in the revenue and surplus following the general depression in trade. The depression continued to the close of 1908-09, after which a considerable improvement took place.

Looking further into the details by provinces it is found that there are considerable differences in the percentage of expenditure to the gross revenue, the expenditure and net revenue realised per square mile of forest, and in the value of forest produce given away to the people free of charge in the various provinces. The following table gives some interesting details showing the connection between expenditure incurred and revenue realised :—

The figures given are the average of five years ending 1908-09.

Province.	Expenditure under all heads per square mile under control of the Forest Department.	Percentage of expenditure to gross revenue.	Net revenue realised per square mile of forests under the control of the Forest Department.	Value of forest produce supplied to right-holders and granted free per square mile under control of the Forest Department.	Total net return including value of forest produce supplied to right-holders and granted free per square mile under control of the Forest Department.	Percentage of expenditure to gross revenue including value of forest produce supplied to right-holders and granted free.
1	2	3	4	5	6	7
	Rs.		Rs.	Rs.	Rs.	
Bengal	76	56·2	60	23	83	48·0
United Provinces ...	313	54·7	259	52	311	50·1
Punjab	119	61·8	56	88	144	45·2
Burma	28	39·0	45	2	47	37·7
Eastern Bengal and Assam ...	25	57·2	19	17	36	41·0
Central Provinces and Berar...	66	65·1	35	9	44	59·6
*Coorg	186	41·5	262	·6	262·6	41·4
†North-West Frontier Province	369	56·8	398	82	480	50·4
Ajmer	118	81·0	28	129	157	43·0
Baluchistan	79	127·5	...	44	44	74·3
Andamans	142	60·1	94	8	102	58·0
Madras	127	73·7	45	5	50	71·4
Bombay	142	58·4	101	113	214	39·9

* The high return given by Coorg is due to the great value of its principal timber, sandalwood.
† The area is small, 236 square miles only, the principal timber, deodar, is valuable.

Certain facts appear clear from the above. First it is evident that the financial position in any province cannot be judged by the percentage of expenditure to gross revenue. At the present time our Indian forests are very far from being in full bearing. The more accessible areas have been overworked and have to be nursed for a while. In such cases money put into them will not bear immediate return but will pay a hundred-fold in the future. In a great many other cases the forests are not being worked at all or are being worked only for the most valuable species. As the forests are opened out and come into full bearing, the percentage of the total expenditure to gross revenue may be expected eventually to decrease, but it must always be larger in provinces where the yield of the forests is least valuable, the means of extraction costly, or the demands of the people excessive. The percentage of expenditure to revenue must always vary considerably following these factors; thus in Burma the percentage of charges to revenue is very low. Here we have the most valuable timber of the Indian Empire, *viz.*, teak, brought out very cheaply by water transport with a demand by the people from the Government forests which is insignificant compared with the total outturn. Yet this low percentage of expenditure to revenue is not a sign of really satisfactory forest management. In the case of Burma it means that the forests are in the main worked only for the most valuable product—teak. There are enormous stores of other valuable timbers and other forest produce that cannot be brought to market until very considerable sums are expended in the opening out of communications and in strengthening the staff. The percentage of expenditure to revenue will then rise considerably for a time at any rate, but so will the net revenue and the return per square mile of forests will also rise. At present this is Rs. 45* only in Burma as compared with Rs. 259 in the United Provinces. In these provinces the percentage of expenditure to the revenue is 54 per cent as against 39 per cent in Burma, so it is evident that the best results for a given area of forest cannot be obtained by striving to show the lowest possible percentage of expenditure to revenue.

* These figures are averages for the five years ending 1908-09.

Next, it is apparent that the financial position in any province can only be judged by the net revenue realised per unit of forests. Taking this per square mile under control of the Forest Department, we find that the North-West Frontier Province has a net revenue per square mile of Rs. 398, this province also shows the highest expenditure per square mile, *viz.*, Rs. 369. Omitting Coorg which shows a high net return per square mile owing to the great value of its principal produce sandalwood, we find that the second best position is held by the United Provinces with a net annual return per square mile of Rs. 259; at the same time these provinces show the second highest expenditure per square mile, *i.e.*, Rs. 313. The same relation between the expenditure and the *net* revenue realised per unit of forest managed may be traced in the other provinces in varying degrees according to circumstances. In some provinces high net returns cannot be expected owing either to the small value of the forest produce available or the quantity of produce which is given away to the people, *e.g.*, the Central Provinces and Ajmer. But it may be safely asserted that in provinces, where the forest produce is valuable and not yet fully worked, increased expenditure is necessary in order to earn increased revenue.

It may no doubt be held that the steady rise in the forest revenue which is shown to have occurred during the past 20 years has been caused by the general development of the country, the spread of railways and roads and consequent improved markets, and increased prices for forest produce,* and that the increased expenditure has grown with the revenue and has had little to do with the earning of it—no doubt these factors have all influenced the forest revenues and there is no doubt that the royalty payable on some of the more valuable forest products has increased considerably, but on the other hand vast quantities of forest produce are brought out from areas which formerly were not worked at all, and many timbers of inferior species and much minor forest produce is brought out and sold which of old was left to be wasted in the

* We have endeavoured to trace how far increased prices have caused increased revenue, but so far we cannot form any definite conclusions. The matter is very obscure owing to changes in methods of collecting royalty.

forests. This has been rendered possible only by the construction of forest roads, tramways and the like, by which alone the bulk of our forest produce can be brought to market. It is in the construction of roads and other means of communication that increased expenditure will show the quickest return in increased revenue.

In the foregoing tables and observations the total expenditure under all heads has been included and considered, and we have seen that in the five years ending 1908-09 amongst the major provinces, the province which spent the most money per square mile was able to show the largest net revenue per square mile of forest managed. In these figures, however, are included many items of extraordinary expenditure, such as those incurred on forest settlement, forest surveys and demarcation, which, however necessary, do not tend directly to increase the forest revenue. Let us endeavour to trace how expenditure on establishment alone has influenced the forest revenue. The following gives the amount spent on permanent and temporary establishments combined with revenue realised during the past 20 years :—

Year.	Amount spent on permanent and temporary establishments combined.	Average annual increase of column (2) as compared with the previous five years.	Net revenue realised.	Average annual increase of column (4) as compared with the previous five years.
1	2	3	4	5
	Rs.	Rs.	Rs.	Rs.
1890-91	29,95,824		69,04,010	
1891-92	30,82,159		67,22,828	
1892-93	33,62,710	6,92,691	74,38,110	23,03,901
1893-94	35,24,310		83,72,320	
1894-95	37,50,070		74,75,590	
1895-96	38,36,330		77,66,770	
1896-97	38,53,440		78,11,360	
1897-98	39,98,030	6,39,323	75,99,760	6,62,912
1898-99	40,76,260		90,04,600	
1899-00	41,47,630		79,84,930	
1900-01	42,11,228		86,10,453	
1901-02	42,58,133		70,77,327	
1902-03	43,42,417	3,54,593	82,22,209	9,70,883
1903-04	44,16,622		1,00,49,754	
1904-05	44,56,256		1,10,62,094	
1905-06	45,87,751		1,24,16,072	
1906-07	48,18,787		1,24,27,686	
1907-08	52,55,075	8,79,725	1,13,50,046	26,01,575
1908-09	55,51,589		1,07,30,765	
1909-10	58,70,080		1,11,05,140	

From this it is apparent that following an increase on establishment charges of Rs. 28,74,256 or nearly 50 per cent during the past 20 years, there has been a corresponding increase of Rs. 42,01,130 or 38 per cent on the net annual revenue realised.

As fresh forest tracts are opened out by the construction of forest roads and it is desired to work them systematically, increased establishment becomes necessary. Working-plans have to be prepared so that the forest capital may be kept intact and not wasted by over-cutting. The trees have to be marked, timber operations supervised, theft and illicit working guarded against, depôts have to be established and arrangements made to realise the revenue due. As larger areas come under control and working, fresh divisions have to be formed and new Conservators have to be appointed. This increased establishment is absolutely necessary if conservative forest management is to accompany increased revenue. Again, numerous steps are necessary if our forests are to be kept intact and brought to, and maintained in, such a condition that they will permanently yield the highest net return. The young crops must be tended and the reproduction of the forests, particularly as regards the most valuable species, must be insured, whether by cultural operations, plantations or improvement fellings. As a rule all valuable forest-bearing tracts must be protected from fire, and the estate as a whole has to be protected from theft and injury. Measures must also be taken to ensure that a proper education is given to the staff that has to manage these estates, and to carry out scientific research by which new sources of forest revenue may be opened out.

The averages of the five years ending 1899-1900* compared with the averages of five years ending 1908-09 are shown in the following statement:—

Details of expenditure.	Five years ending 1899-1900.	Five years ending 1908-09.
	Rs.	Rs.
1. Total forest expenditure	1,12,69,486	1,41,05,829
2. Forest settlements, surveys and demarcation ...	5,96,814	4,76,133
3. Extraction, and construction of roads and buildings.	5,03,401	10,54,645
4. Fire-protection	4,09,837	5,81,056
5. Cultural operations	3,53,845	5,65,914
6. Forest science and education	73,088	1,24,162

* Figures for earlier periods are not available under all heads.

Money spent on matters such as these does not directly produce revenue. The expenditure is capital and not ordinary, but if any of these matters receive insufficient attention the forest estate will decline in value and will not bring in to its owner, Government, the full revenue, or to the people the full advantages which may legitimately be expected from it. This capital expenditure will become less and less as time goes on, but will not cease in India for a long period of years yet.

In Europe all expenses of constitution, such as settlement, survey and demarcation, have been met long ago. Expenditure on fire conservancy is not generally necessary, and rates of pay for establishment are lower than in India. Roads have for the most part been constructed and only repairs have to be paid for. The forests are fully worked and every stick of material can be sold at prices which are very high compared with present prices in India. It is therefore not surprising to find that the percentage of expenditure to gross revenue is not usually so high as obtains in India and that the net revenue per unit is very much greater. The following table, which was placed before the Royal Commission on Coast Erosion, may be studied with advantage:—

Country.	Area of Forests. Acres.	Revenue per acre of total area. Shillings.	Net return per acre. Shillings.	Percentage of expenditure to gross revenue.	Remarks.
1. Prussia	7,130,912	17·3	10·0	42·2	A net return per acre of 10 shillings is equal to Rs. 4,800 per square mile. Compare this with the net return per square mile from the Indian forests which nowhere exceeds Rs. 259 in the major provinces.
2. Bavaria	2,315,252	17·8	10·4	41·6	
3. Wurtemberg	483,437	37·4	25·3	32·3	
4. Saxony	443,312	32·7	21·2	35·1	
5. Alsace-Lorraine	380,649	19·4	12·0	38·1	
6. Baden	234,455	33·4	19·9	40·4	
7. Brunswick	210,338	21·1	11·3	46·4	
8. Hesse Darmstadt—					
(*a*) State Forests...	8,114	18·1	9·4	48·0	
(*b*) Domain Forests	170,687	23·7	11·3	52·3	
9. Saxe-Weimar	114,349	26·7	17·7	33·7	
10. Saxe-Meiningen	109,878	29·8	21·3	28·5	
11. Anhalt	71,563	21·1	16·6	21·3	
12. Waldeck-Pyrmont	67,330	10·4	6·2	40·3	
13. Oldenburg—					
(*a*) Duchy of Oldenburg	38,505	8·7	4·9	43·6	
(*b*) Principality of Birkenfeld... ...	16,015	13·0	6·5	50·0	
(*c*) Principality of Lubeck	9,954	20·8	12·2	41·3	
14. Schwarzburg-Rudolstadt	51,979	24·7	18·1	26·7	
15. Schwarzburg-Sondershausen	42,620	26·3	18·1	31·1	

Whilst admitting that improved prices may have had some effect on the increased revenue of the past 20 years, I have above attempted to show that it is mainly by increased expenditure on roads, tramways and other mechanical means of transport, accompanied by an increased establishment, that increased revenue has been earned in the past and must be earned in the future. Let us now examine the figures of outturn of timber and fuel and see how far they justify this view. The following table is of great interest in this connection :—

Province.	Timber removed by Government Agency.		Timber removed by purchasers.		Average total outturn, Timber.		Fuel removed by Government Agency.	
	Average of 5 years ending 1908-09 (c.ft.)	Average of 5 years ending 1896-97 (c. ft.)	Average of 5 years ending 1908-09 (c. ft.)	Average of 5 years ending 1896-97 (c. ft.)	Five years ending 1908-09 (c. ft.)	Five years ending 1896-97 (c. ft.)	Average of 5 years ending 1908-09 (c. ft.)	Average of 5 years ending 1896-97 (c. ft.)
Bengal	89,497	182,306	5,152,139	5,398,178			152,794	127,434
United Provinces	152,832	532,806	4,186,339	277,686			609,968	2,531,337
Punjab and North-West Frontier Province	815,074	756,039	3,994,386	489,786			2,153,564	2,528,427
Burma	3,939,957	2,814.544	23,623,754	19,720,608			215,680	2,236
Eastern Bengal and Assam ...	434,693	83,391	4,585,330	2,857,410			27,283	10,398
Central Provinces and Berar ...	887,517	281,372	3,333,191	1,646,117			1,121,739	1,781,162
Coorg	105,119	78,380	149,407	311,625	59,459,969	45,491,226	16,004	...
Ajmer	478	167	3,922	11,385			23,662	221
Baluchistan	745	544	6,863	2,911			47,486	10,430
Andamans	534,627	300,132	35,699	47,898			678,497	17,254
Madras	652,329	366,496	2,190,116	2,450,160			11,659,673	2,538,820
Bombay	1,106,151	1,404,464	3,479,804	5,476,800			4,371.790	14,850,110
To tal ...	8,719,019	6,800,632	50,740,950	38,690,594	...	...	21,078,140	24,397,829

Province.	Fuel removed by purchasers.		Average total outturn fuel.		Average total outturn of timber and fuel for five years ending.		Average total outturn of timber and fuel per square mile of reserved and protected forest.	
	Average of 5 years ending 1908-09 (c. ft.)	Average of 5 years ending 1896-97 (c. ft.)	Five years ending 1908-09 (c. ft.)	Five years ending 1896-97 (c. ft.)	1908-09 (c. ft.)	1896-97 (c. ft.)	Five years ending 1908-09 (c. ft.)	Five years ending 1896-97 (c. ft.)
Bengal	16,936,823	19,547,999					4,709	3,892
United Provinces	6,944,772	2,880,525					3,872	3,452
Punjab and North-West Frontier Province.	2,168,126	1,580,380					3,948	4,338
Burma	14,871,044	10,357,213					454	1,872
Eastern Bengal and Assam ...	4,934,462	1,685,136					825	353
entral Provinces and Berar ...	14,399,669	11,968,927					1,048	702
Coorg	68,050	218,240	116,574,182	104,337,489	176,034,151	149,828,715	449	645
Ajmer	548,743	252,688					4,124	1,979
Baluchistan	346,407	441,681					229	768
Andamans	8,791	526,975					3,630	3,148
Madras	9,292,784	9,859,360					*1,236	*833
Bombay	24,976,371	20,620,536					*2,938	*3,205
Total ...	95,496,042	79,939,660	...	...	...	...	27,462	25,187

* Includes all forest areas. Separate figures are not given for reserved and protected forests in Madras and Bombay.

We see therefore that with some few exceptions there has been a general and very considerable increase in outturn of both timber and fuel, not only in the total amount exported but in the outturn per square mile of reserved and protected forests under the control of the Forest Department. This increased outturn is the main cause of the increased net revenue, and this has been rendered possible only by increased expenditure.

Average surplus for the 5 years ending 1908-09 was Rs. 1,15,97333—average surplus for the 5 years ending 1898-99 was Rs. 79,19,616.

Again let us consider the returns from minor forest produce. The following shows the revenue realised for the five years ending 1908-09 as compared with the five previous years :—

Minor Forest Produce.

Year.	Annual revenue.	Average annual revenue for quinquennium.	Year.	Annual revenue.	Average annual revenue for quinquennium.	Remarks.
	Rs.	Rs.		Rs.	Rs.	
1899-1900	38,44,750		1904-1905	41,46,781		
1900-1901	39,28,866		1905-1906	48,81,696		
1901-1902	32,01,402	34,60,464	1906-1907	49,38,061	48,29,631	
1902-1903	33,61,047		1907-1908	51,84,210		
1903-1904	34,66,257		1908-1909	49,97,407		
Tota ...	1,73,02,322		Total ...	2,41,48,155		

There has thus been an average annual increase of nearly 14 lakhs of rupees. Apart from grazing, from which some 22 lakhs are annually realised, the revenue is realised from a variety of articles such as fodder and thatching grass, resin and turpentine, gums and barks, rubber, horns and hides, etc. The increase in revenue is directly due to the opening out of forests by roads, without which the bulk of such produce would not reach the markets at all; in some measure it may also be ascribed to increased establishment without which neither could extraction be controlled nor the revenue due be realised.

A few remarks are necessary regarding expenditure on Forest scientific research and education. These charges have risen considerably of late years, and in 1908-09 stood at Rs. 1,83,191 as against Rs. 73,550 ten years ago. This is chiefly due to the creation of the Forest Research Institute at Dehra Dun and to the endeavours that have been made of late years to improve the education given to Rangers and to candidates for the provincial service. It cannot, we think, be gainsaid that on the proper education of these officers the proper management of the Government forest estates, and the amount of net revenue they can be made to yield, in great measure depends. This will be more than ever so in the future, the accepted policy being to employ natives of India more and more in charge of forest divisions. A practically new provincial service, with very favourable rates of pay, has lately been sanctioned, and it is the duty of Government to see that candidates for this service should receive a first class education such as will fit them for the responsible positions which they will hold. Any undue economy in this direction must have the most injurious effect on the country as well as on the forest revenues.

Again to Forest research we must chiefly look for the discovery of fresh sources of revenue. Already numerous investigations are in progress, such as the possibility of manufacturing tannin extracts from Indian forest products, on the suitability of various fibres, grasses, bamboos and timbers for the manufacture of paper, on the possibility of opening out a trade in timbers not yet utilised, and the fostering of the match-making industry in

India. These researches deserve the fullest support from the Government of India leading, as they surely will, to large increases of trade and Government revenue.

From the statistics of past years, and the considerations which we have endeavoured to bring forward above, it may, we think, be concluded—

(*i*) That a low percentage of forest expenditure to gross revenue realised cannot in India be considered as proving the most satisfactory management from a commercial point of view.

(*ii*) That this must be judged by the net revenue realised per unit of forest concerned, and that the best results in the present condition of Indian forestry cannot be realised without a high percentage of expenditure to revenue, and a high expenditure per square mile.

(*iii*) That if it is desired to increase the net forest revenue it will be necessary to increase and not decrease the expenditure, especially on establishments and means of communications in provinces where there is valuable produce, and which are not yet worked to their full capacity, and that such increase of expenditure will lead to an increased net revenue per square mile and eventual decrease in the percentage of revenue to expenditure.

(*iv*) That undue economy in expenditure on education and research must result in injury to the forests and the country and in the failure to open out new sources of revenue.

(*v*) Finally, that large areas of forests in India are managed almost entirely for the benefit of the people, and not as revenue-paying estates. For the protection and management of these forests considerable expenditure is necessary, a return being received not in the shape of revenue, but in the fact that the people receive free of payment forest produce to the value of more than 45 lakhs of rupees per annum.

DEPARTMENTAL TEAK EXTRACTION IN THE ZIGON DIVISION, BURMA.

Most of the teak forests of Burma are worked by purchase contractors under leases from the Government. For various reasons the forests in the basin of the Hlaing river are worked by the Department direct. These forests lie on the western slopes of the Pegu Yomas in the Zigon, Tharrawaddy and Prome Divisions, but I am now only concerned with the former. The streams which drain the Zigon forests, and down which all the teak logs are floated, flow into the Myitmaka or Hlaing river, which is the river on which Rangoon stands. The timber thus floats direct to its market, and has the advantage over timber from most other divisions that it does not have to be brought through any side creeks or canals in the delta region.

The lengths of float are as follows :—

(i) From the forest to the shallows, where all the four floating streams of the division become badly silted on reaching dead water, from 20 to 30 miles.

(ii) Down the Myitmaka or Hlaing river to the Sanywe depôt where measurement is done, 94, 79, 61, and 52 miles, respectively, for the four streams.

(iii) From the Sanywe depôt to the Rangoon depôt, about 100 miles. In the floating streams the rises in two are practically always good, and in the other two usually, so that there is not much to complain of on that score. Three of the four streams, however, are badly encumbered by silting in their lower reaches and logs from the stream with the biggest outturn have two series of shallows to get over. Over these shallows in all cases the logs have to be dragged by elephants or men.

2. The kind of timber extracted, that is the length of the logs and correctness of the logging, depends largely on the kind of contract in force, and on the supervision the contractor's work gets. But most of all it depends on the way in which the outturn is paid for, as a contractor will unnaturally do those things which

it is financially most worth his while to do. There have been three kinds of contract used at various times on this work, and their chief points of difference are in the methods of paying for the timber. As regards supervision, the work of extraction has until the last two years had practically none, as no special officer could be deputed for the work and the divisional officer had his hands far too full of sylvicultural operations, and the like, to be able to find the time necessary to visit the more remote places where extraction was going on. Under such conditions the contract and the inducements it had to offer were all that could be looked to keep extraction in the state it should be in, and it would be a very comprehensive and elaborate contract that could offer inducements likely to check all the many malpractices that were current.

3. The earliest form of contract provided for the payment for the timber at fixed rates for each class. The classes were determined only by the length and girth of the logs. The biggest class was for those logs over 22 feet long and over six feet girth, and the rate paid was Rs. 22 a ton, delivered at Rangoon. The result of such payments was that logs were cut just to the required length and no more. If a tree was of a girth that would not enter class I, it would be logged of such a length as just to qualify for class II, while if over six feet girth, it would be cut just 22 or 23 feet long, as that was all that was necessary. The object of this was that the logs, while qualifying for the maximum rate to which their girth entitled them, might yet be as light as possible for the elephants to drag. I do not say this is financially sound though the contractors seem to have thought it was. I have not gone into the matter but it seems that it was merely throwing money away to butt off say six feet from the top of a log and abandon that six feet so that the log might only just qualify for its class. That six feet would have been paid for at the same rate as the rest of the log had it not been butted off. Be this as it may, that is what the contractors used to do, and I have seen these ancient butts from the top ends of logs lying in the forest. It is thus evident that in some cases logs were cut shorter than the

elephants could have dragged, so that this form of contract did not tend to produce the longest timber possible. As each successive class had a smaller and smaller rate, the smaller the log the less the contractor bothered about it, and very little insistence could be laid on the entire clearing up of the forest. The result was very few, if any, small or "refuse" logs, these all being left in the forest in the tops, and gradually getting burnt up.

As an example of my statement that the general run of the logs cut under such contracts as this was smaller than that cut under the second form of contract, to be described below, I may mention that there are two streams in this division still containing 400 logs that were originally cut under such contracts. The smaller size of the timber is at once obvious.

Other disadvantages of this form of contract were the absence of any logging rules and the many classes, involving much office work in the preparation of contractors' accounts.

4. The second type of contract was introduced about eight years ago. In this the payment was by a sliding scale. There were only two classes, one for big logs, the other for small and "refuse" logs. The rate for the first class logs depended on the average log. It was Rs. 10 plus or minus 3 annas for every cubic foot by which the average log exceeded or fell short of 50 c. ft. The second class had a fixed rate of Rs. 8 per ton.

Such rates as these put a very effectual stop to the cutting of logs shorter than the elephants' maximum capacity. It was now the object of every contractor to get his average log in the nineties, and to extract no logs much less than about 80 c. ft. unless they were sure to go into class II. Even then the contractors did not believe that class II paid them, and gave as little attention to it as they were allowed to. Owing to the lack of supervision already mentioned, they could almost do as they liked in this respect, and hardly cut any small or "refuse" logs. All their energies were turned to the remunerative big logs. The rate used to work up to Rs. 18 or so a ton, and there being no girth limits, it made for long logs. There can be no doubt that this form of contract increased the length of the timber extracted.

Besides making contractors cut up to full elephant power, it had the obvious advantage of causing less office work.

The object of the second class was to include all the small logs from the tops, which would otherwise be wasted. It was hence not possible to have a sliding rate dependant on the average log or the smallest logs would have been left behind, as tending to lower this average, yet even the very smallest logs that are still marketable are wanted. A fixed rate was therefore necessary and, on account of the smaller value of the timber, it must be small so that no elephant-owning contractor will care to employ his elephants on such low paid logs, unless he must. Consequently only supervision and driving, with a threat of fines, can ever get all the available small logs extracted. It might really be financially worth the while of a man owning only one elephant, with buffaloes, to work only small logs, the large number he could work from places which buffaloes could not ordinarily get at would counterbalance the low rate, but no such contractors will think for a moment of such a method of work.

The disadvantages of this form of contract would seem to be the following :—

(*a*) There is no inducement to good logging. For example, if there is a bulge in a log the contractor manœuvres to get that in the middle of his log. If a tree forks he will cut one branch at the fork, the other some fifteen feet beyond it, but always so that the centre girth comes on the large sized part of the log. Again, a straight log will be disfigured by the inclusion of a crooked piece which should have been left in the crown, merely to get extra length. Then, starting from the bottom of the tree the contractor always cuts the biggest log he could drag, so that such log often contained a hollow. This would mean that a tree which could have yielded a bottom log of 15 feet length to the end of the hollow and then a second log of 30 feet, sound and free from branches, would be cut so that the 30 foot log would be at the bottom, hollow

for half its length, and the 15 foot log at the top. The contractor would stand to lose nothing by so doing but would have spoilt a very fine log.

(*b*) Some trees, for sylvicultural reasons, have to be girdled, under size. Such will, as a rule, yield logs of 60 or 70 c. ft. only. Logs from such trees were held to be likely to reduce the average of class I, so such trees were either not felled or felled and cut up into short lengths of 25 c. ft. so as to be sure to go into class II, although the whole bole might have been quite sound.

(*c*) Similarly, trees standing in difficult places which could only be extracted in 60 or 70 c. ft. lengths, but not in 80 or 90 c. ft. lengths, used to be left unfelled.

(*d*) The desire for a very big average log made it still harder to get difficult compartments taken up, compartments where such very big logs would be either a source of trouble, or beyond the capacity of the elephants.

5. The third form of contract has only been introduced this year. It is a modification of the last, retaining the sliding rate to keep up the length of the logs, but introducing logging rules, fines for bad logging, and a special class for the very best logs which are deemed capable of yielding squares fit for Admiralty use. Disadvantages *b*, *c*, and *d* still however remain, and must be fought by supervision, as must also the tendency on the part of elephant contractors not to bring out their small logs.

The classes now are therefore—

First class—logs over 75 c. ft. and over 25 feet long, straight, sound and free from branches—a sliding rate.

Second class—logs over 50 c. ft. not classed as first or as "refuse," a sliding rate less than the first class one.

Third class—logs less than 50 c. ft. and such logs over that size as may be classed as "refuse," a fixed rate.

It may be easy enough to point to disadvantages, but it is not so easy to point to remedies. In this case the disadvantages are still the objection of the contractors to 60 or 70 c. ft. logs, and their objection to extracting "refuse." The first could be overcome

by splitting up the second class into two, one for over 75 c. ft. and one for logs under that size, both with a sliding scale. It would then be of more advantage to extract a log of 65 c. ft. as such rather than to cut it into two, as it would not be reducing the average of the really big logs in that class.

As regards "refuse," contractors have such an objection to using their elephants on small logs that usually they hire buffaloes to drag them and this means that they are often cut unnecessarily small. I have already pointed out why I think a fixed rate must be given for small logs but to split class III into two, for logs over and under 30 c. ft., the one with a fixed rate of about Rs. 10 and the other with Rs. 8 seems as if it would help to prevent these logs from being cut smaller than necessary.

I myself would welcome a contract with five such classes, as being as far as it is possible to go in the multiplication of classes, but I have no doubt my clerks would not, and I regard it as an open question whether the benefit to be gained by this further subdivision of classes is sufficient to warrant the extra work in classification and preparation of accounts that it would entail. It may be said that I have still made no provision for what a contractor is likely to do with a log of 50 c. ft., but I think I have gone far enough in my subdivision of classes although the further one can subdivide the more worth the contractor's while is it to extract every log in the longest straight length available.

6. Since writing the above a conference has been held at Prome at which the contract form was modified on very much the lines I have been suggesting, both the first and second classes being split into three, but this does not seem any reason for holding this article back.

7. Besides the form of contract and the method of paying for the timber produced, the work of contractors is influenced by the way contracts are given to them, that is, by the number of trees per elephant and the kind. Formerly it used to be the practice to give extensive contracts for the extraction of dead teak timber either standing or fallen. In some reserves the whole forest would be split up into four or five big blocks, corresponding with the

drainages of the chief rivers in it, and a contract for dead and fallen teak would be given in each block to a big contractor. This was when the working-plan girdlings alone were not enough to occupy all the elephants available. The result of this was two-fold. Owing to the size of the areas the contractors were able to pick and choose and the easy parts became worked out. Owing to the absence of supervision, illicit girdling to provide the dead timber in readily accessible places was freely indulged in. It was all that could have been expected. In one reserve practically all the contractors had to be broken in the same year for this offence.

Then it became the exception, not the rule, to give contracts for dead and fallen timber, and this tends to concentrate working and make it possible to know for certain, years afterwards, which contractor has committed any faults of extraction that one may discover. Now and again contracts for dead and fallen timber may still be advisable when girdlings happen to be short, but usually there is only too big a balance of unextracted girdlings waiting, and also with the present supervision a few such contracts can safely be given.

8. In my opening paragraph I have made mention of the shallows which occur on all our floating streams, and these places have a considerable bearing on the whole question of extraction in this division. While a contractor is logging his trees he is very likely wondering how he is going to get the big logs past these shallows, and in some cases it must influence the size he cuts them into.

The shallows occur in the plains some way from the foot of the hills and are caused by the river water meeting the flood water from the Irrawaddy where there is very little fall to help the former. This part of Burma may not be commonly called so, but it undoubtedly is really the beginning of the Irrawaddy delta, as most of the country between the Myitmaka or Hlaing river and the Irrawaddy is submerged in the rains and a good number of big and little channels connect the two rivers. This flooding extends several miles east of the Myitmaka and it is where the floating stream water begins to feel these floods and be checked

by them that silt is deposited and shallows are formed. To see any one of these shallows in the rains is an impressive sight, and makes one wonder how so much timber is ever got past. What has a few miles above been a stately stream with high banks and a large volume of water has dwindled to the veriest ditch out of which the water takes every possible opportunity of escape, both over such banks as are left and down innumerable side channels. The whole country, ordinarily supposed to be paddy fields, becomes a lake in which here and there the remains of paddy plants may be seen which have been put in early by some enthusiastic cultivator. (He has frequently to plant his paddy as much as three times, and that crop succeeds, more or less, which happens to remain still rooted when the floods subside.) The logs follow the water, that is, they go everywhere, but there is usually some kind of channel within which attempts are made to keep them. Small logs give the most trouble as it does not need much depth of water to send them far afield, so that the whole place becomes strewn with logs in all directions as far as one can see. Elephants have to be sent to these shallows every year as without their help scarcely a log would get through, and this is a job that the elephant owners particularly detest, and with reason. The elephants have to come in about five days' journey from the forests where they were following their proper vocation in following their logs down the stream after every rise, and pushing them off from the rocks and banks where they had stuck. There is no road to come by as all the tracks are across paddy fields which are planted up by that time. The elephants have to follow down the banks of the stream and go where there is least paddy and there are fewest paddy bunds to destroy, or the owner will be inundated with demands for compensation, even if his elephants are not speared in the leg at night. When they get to the shallows the elephants have to work all day in from one to five feet of water over one or two feet of mud, and to drag big logs over sand, let alone mud, is hard work when their feet sink in so much at every step. At night it is hard to find a dry spot for the elephants to graze or sleep on; all that is not planted up paddy fields is

submerged land, and the weary elephants show a great desire to wander and eat the tempting young paddy plants. Sometimes paddy has to be bought to feed the elephants on while at this work. Having had his elephants on the shallows for a month, during which time a contractor may have got about half his outturn over, they will probably have to be laid by for another month to recover. No wonder the work is not exactly popular !

9. This year the stream which is giving most trouble is the biggest one we have. It drains 167 square miles of reserved forest and has good rises. Where it passes under the Rangoon-Prome Railway it is quite an imposing stream, but it does not go much further like that. Several years ago the P. W. D. made a road across the country where this stream meets the flood waters, evidently all unware of what was going to happen. The channel the stream was then following was nearly silted up so that it did not receive much of a bridge and it being quite impossible to say where the stream would go next, no big bridge was made elsewhere. That year the stream abandoned its previous course altogether leaving the bridge high and dry, and turned to the south. For several years it wandered over the country, now going under this bridge now under that, usually finding the particular bridge it had selected much too small and washing out the approaches on one or both sides. Then in 1908 it treated the biggest bridge in this way and in 1909 abandoned it for the smallest, and to get at this small bridge it found it convenient to go along the borrow-pits and make a right-angled turn at the bridge. This sufficed for 1909 and 1910 during both of which years over 2,000 logs were got through that little bridge, and the road answered splendidly as a bund on one side. But this year the road has given up the unequal struggle and has been breached in four yawning gaps, through which the water is pouring at present like a mill-race with a mighty rushing sound. Some 500 logs have already gone through, but this way leads to nowhere but wastes of elephant grass and thickly overgrown fisheries, so that they will have to come back, somehow some time.

Logs from this particular stream, as if they had not passed through enough trials already, have a further series of shallows to

get over lower down in the Myitmaka river. This is where our second floating stream used to meet the Myitmaka exactly at right angles. This formed a fine whirlpool, held back the Myitmaka and deposited much silt where the slack water occurred. Then we had the phenomenon of the water running backwards up the Myitmaka over the shallows, instead of down, and logs had to be poled down, one by one, against a stiff current flowing the wrong way. This used to be the state of affairs nearly all the rains, in fact except when the Irrawaddy water was at its very highest, when a flow the right way was caused. This has now been to some extent alleviated by a cut to bring the floating stream in at an angle, and nowadays we get more flow down stream over these shallows than we used to.

Further down the Myitmaka or Hlaing river there is not much difficulty, the most interesting feature being that the country becomes still more submerged and villages are found standing in this water with no dry land within miles of them. Such a locality gives the logs admirable chances of getting away into the bushes and hiding themselves, chances they are not slow to take if given the least opportunity and raftsmen are not on the alert. When the Irrawaddy falls, all this water drains off and with it go the rafts to depôt, during October and November. At high water they cannot go down, as for one thing the Irrawaddy water entering the Myitmaka in a large stream lower down, creates an adverse flow above that. Then the current below that point, swollen by much Irrawaddy water, is too fast and there is a railway bridge to dodge as well as the job of pulling up every night.

The management of the logs after leaving the shallows has now been taken off the contractors' shoulders, and this leaves them more free to work in the jungles, and does not give them so many petty sub-contractors to finance at a time when money is short.

E. V. ELLIS.

THARRAWADDY:
23rd September 1911.

A NEW SPECIES OF MILDEW.

This is being called new not because it has been now noticed for the first time, but because it has been now for the first time scientifically identified. It was first noticed by the writer in 1896 on teak leaves in the dry teak forests of Rehli Range in the Saugor Division of the Northern Circle, C. P., and also in the adjoining forests of the Damoh Division. By the next year it had spread in all the teak forests of the Saugor Division. The writer of course does not know when it was first noticed elsewhere, but since then he has seen it in the forests of several divisions of the Northern and Southern Circles of the C. P. in Berar, and also in the forests of Bhopal State. Thus it appears to have spread over the whole of the Central Provinces and Berar, and parts of Central India. It would, however, be very interesting to learn how far it has actually spread, and if it was noticed anywhere else earlier.

This fungus attacks only the upper surface of teak leaves, and generally spreads over all the trees of the same species in the same forest without an exception giving a characteristic bluish appearance to the trees. Isolated trees however, at long distances from any infected area, have been found attacked. The attack, though so widespread, does not appear to do any practical damage to the trees attacked, as it has been often and often noticed that it neither caused any appreciably earlier fall of the leaves, nor any earlier appearance of a new flush of leaves, and so this cannot be expected to have in any way affected or retarded the growth of the trees attacked. It is, however, probable that it interferes to some extent with the assimilative power of the chlorophyll by partially cutting off the light.

It was perhaps for this, though the attack is so very conspicuous, making the leaves look as if coated with a dull whitewash, that no particular notice was taken of it so long, and because it was so very common and widespread that it was believed to be a known fungus.

In the touring season of 1906-07 the writer noticed for the first time in the forests of the Jubbulpore Division that the leaves of *Cordia Macleodii* were attacked apparently by the same fungus

and exactly in a similar manner, *i.e.*, the upper surface of the leaves of this species of tree was attacked as used to be the case with teak only up to this time, but of no other species at all. This led him to make some investigations, and it was noticed that the trees attacked did not suffer the least damage, as was the case with teak also. As the writer could only make observations and no examinations with microscopes, he brought this fact to the notice of his Conservator, and under his instructions forwarded specimens of affected leaves both of teak and *Cordia Macleodii* to Dr. E. J. Butler, the Imperial Mycologist at Pusa, who very kindly had the fungus identified. Then it was found that it was the same fungus that attacks the two different species of trees, and that it had not been identified before.

Dr. Butler had suggested that the writer should write a note on this subject, but it had been laid aside till interest in it was again aroused by noticing its attack on teak but not on *Cordia Macleodii* in the Amraoti Division of Berar, during the current touring season. It is interesting to note that during the last 15 years in which the fungus has spread over a large extent of country, it apparently has attacked only one other species besides teak, and that also apparently over limited areas.

Below is given a copy of D. O. No. 333, dated the 14th March 1908, from the Imperial Mycologist, to the address of the writer with a description of the fungus :—

"I beg to thank you for the beautiful set of specimens of mildew on teak and *Cordia Macleodii*, sent with your letter No. G-2742 dated Jubbulpore, 10th instant.

"These specimens have enabled me to determine that the mildew is identical on both host plants and is *Uncinula Tectonæ*, Salmon.

"As it might be of interest to other Forest Officers if you were to write a note on this new parasite in the *Indian Forester* or elsewhere, I attach an extract from a paper on 'Notes on some species of *Erysiphaceæ* from India' by Mr. E. S. Salmon (who is probably the chief authority on the mildews), published in the Annales Mycologici, December 1907."

Extract from Mr. E. S. Salmon's "Notes."

In November last Dr. E. J. Butler sent me some excellent specimens of an *Uncinula* with the following remarks:—"I recently obtained what appears to be an interesting *Uncinula* on teak, a host I cannot find mentioned for this genus. It appears to do a good deal of damage to teak in Central India, but I have only one leaf, of which I send you part. I cannot identify it with any of the known species." An examination of the material convinced me of the correctness of Dr. Butler's view that we had here a new species of the genus. I give below the diagnosis which I have drawn up from the specimens sent.

Uncinula Tectonæ, sp. Nov.—Epiphyllous; mycelium persistent, thin, effused; perithecia subgregarious, hemispherical, small, about 110″ in diameter, cells 10—15″ wide; appendages numerous, 75 to 100 in number, from slightly less than to slightly exceeding the diameter of the perithecium, often unequal in length in the same perithecium, delicate, hyaline, aseptate, usually thin-walled throughout but sometimes becoming thick-walled and opaque in the lower half, 5—6″ wide towards the base, slightly attenuated upwards and about 4″ wide, apex closely uncinate, sometimes helicoid, asci 4 to 9 small, broadly ovate, with a short distinct stalk, 65—70 × 38—40″ ascospores 6—8, rarely only 4, crowded in the ascus, about 25 × 14.″

Hab. India, Jubbulpore (Central Provinces). On *Tectona grandis*, July 1st, 1907. Collected by the Divisonal Forest Officer.

Distinct among the species of the genus possessing delicate appendages narrowed upwards in the number and the length of the appendages.

A. L. CHATTERJI.

AMRAOTI CAMP,
BERAR.

REPORT ON FOREST ADMINISTRATION IN THE INDORE STATE FOR THE YEAR 1910.

The area of reserved forests in the Indore State at the close of the year amounted, as far as can be gathered, to between 3,300 and 3,400 square miles, but as surveys are not yet completed, and no area statement appears among the appendices to the report, the exact area is not ascertainable. It would be well, when the correct areas of different reserved forests are finally determined, to include a detailed area statement in the annual report.

Surveys and demarcation have made good progress, and when they have been brought to a sufficiently advanced state we hope to see a corresponding progress in the preparation of working-plans where these are necessary. The State contains four Forest Divisions, but in only one, the Indore Division, are working-plans in force, the total area concerned being 444 square miles. Steps are being taken for the compilation of further plans, and we may hope for reasonable progress in the future. An appendix statement showing progress in working-plans, which does not exist at present, would greatly facilitate reference.

The disposal of cases in court appears to give some trouble, for although a Forest Bill was sent up by the Conservator to Council for sanction five years ago, it is still unpassed. This is surely not to the credit of the Council or the machinery of the State, for without a Forest Act to legalise matters it is impossible to effect any real progress in the organisation and control of the forests. Regarding cases pending at the close of the year, one Divisional Officer says : " In this connection I have to mention that having no Forest Law, to obtain convictions on circulars, which we have to bring within the meaning of sections in the Indore Penal Code, is next to impossible, even when the Magistrate has some knowledge of the circumstances existing in the forests, and this I regret to say is most exceptional." It is to be hoped that this unsatisfactory state of affairs will be remedied without delay.

Good results were attained in fire-protection considering the difficulties experienced. Out of 2,136 square miles attempted, 164

square miles were burnt, representing about 92 per cent of success. The large areas of hilly country, often covered with tall, rank, dry grass, the scarcity of water and the sparseness of the population, render the fighting of fires a difficult matter. The cost of protection was from Rs. 6-2-0 to Rs. 6-14-0 per square mile where complete protection was undertaken, and considerably less where the protection was only partial.

The dying of teak poles, noticeable for years past in the Warla forests, is reported to be still very prevalent, the poles dying before they attain any considerable girth. Coppice reproduction of teak, as well as reproduction by root-shoots, is reported to be good, the coppice-shoots attaining a height of 9 feet in six months on good soil in the Indore Division. Teak sowings have generally resulted in failure, while transplants both of teak and of Anjan are reported to have succeeded well.

Experiments in the propagation of lac have been in operation for nearly three years, but in most localities they have met with small success. The reasons for failure are believed to be climatic.

The financial results of the year are more satisfactory than they have been in previous years, the gross revenue being Rs. 3,27,899, the expenditure Rs. 1,69,044, and the surplus Rs. 1,58,855 as compared with Rs. 1,17,477 for the previous year and an average of Rs. 73,274 for the past three years.

We have to thank the Conservator Mr. Biscoe, who is about to retire from the State service, for an interesting report. The progress of forest work during his tenure of office has been steady and useful, and we gather that no small measure of the success attained has been due to the encouragement given by the Minister Rai Bahadur Nanak Chand, C.I.E.

REPORT ON FOREST ADMINISTRATION IN THE TRAVANCORE STATE FOR THE YEAR 1085 M.E.

The area of reserved forests was reduced by 142 acres during the year, and stood at 2,324 square miles 312 acres at the close of the year. Forest settlement made little progress, owing, it is stated, to the slackness of the Division Peshkars entrusted with

the work: these officers have now been ordered by the Government to submit monthly progress reports of forest settlement carried out by them.

Working-plans operations are still in a backward state, only about 77 square miles being under sanctioned working-plans, while plans were under compilation for a further area of about 213 square miles, of which only 36 square miles were taken in hand during the year.

Satisfactory results were attained in fire-protection, about 11 square miles having been burnt out of a total of 1,808 square miles attempted; this result is said to be due to improvement in precautionary measures.

Various works of artificial reproduction were carried out and thinnings in plantations received due attention. Judging by the amount spent on works of improvement in natural forest, however, little seems to have been done. Climbers were cut but the area operated over is not mentioned, and improvement fellings in the interests of the growing stock appear to have been carried out on an inadequate scale.

The gross revenue and expenditure of the year were Rs. 8,68,716 and Rs. 6,47,462 respectively, leaving a surplus of Rs. 2,21,254, which is Rs. 54,046 less than in the previous year, a deficiency explainable by a poor floating season consequent on the belated monsoon.

LIVING TELEGRAPH POLES.

Telegraph poles that live and grow are a curiosity of African engineering. In Uganda a species of wild fig, locally known as the bark cloth tree, is used for poles, and ten years or more ago it was noticed that they took root and began to send out leaves and branches soon after being planted. Since then a line of more than 500 miles of these growing poles has been developed. It is troublesome to maintain, as the leaves cause frequent leakage by contacts and poles are constantly dying and being eaten by termites. The first cost, however, is only 8 to 16 cents per pole, while an iron pole costs $5 to $7 or $8.—[*Capital.*]

NEGLECTED RUBBERS.

HOW "HEVEA" HAS OUSTED ALL THE OTHER VARIETIES.

Possibilities in the Middle East.

The *Financier* of September 4th had the following article upon the preponderance of Hevea cultivation and the prospects of other varieties of rubber :—

The magnitude of the interests now bound up in the successful cultivation of *Hevea Brasiliensis* in the Middle East and elsewhere alone furnishes justification, if such is really called for, of the apparent neglect to which other varieties of rubber-yielding trees have been subjected by the great majority of the world's planting communities. The selection of Hevea by the Middle East planter as the tree for his purpose may have been the combined result of unswerving belief in its possibilities and vicarious experiments in the tentative handling of the few available varieties. It was found, however, that, in the early days, at any rate, of the industry, the cultivation of Hevea constituted the basis of enterprises which could be carried on with less risk of failure from the standpoint of profits than any other cultivation in connection with alienated or non-alienated varieties of rubber trees. In the then state of knowledge as to Hevea's requirements, any attempt to have indulged in what might be termed universal rubber cultivation might have been to court disaster of an over-whelming character. On the principle that it is better to do one thing as well as it can be done than attempt a double task simultaneously and perform both only indifferently well and possibly very badly, the planting communities in the Middle East acted, in our humble opinion, very wisely when they decided to specialise in the matter of Hevea cultivation. Without such specialisation, and no doubt in a very large measure without the assistance of the very able body of scientists who early directed their attention, their knowledge and their energy to perfecting Hevea cultivation at the earliest possible moment, the great plantation industry in the Middle East would have been in a very different position from that which it holds without question to-day. The most ardent believers in its future are among the first to deny that perfection has been reached as

yet in the matter of plantation practice. But working along the lines they have done, the Middle East planters certainly have succeeded in avoiding anything resembling disaster in the past, and do not appear to have laid the foundations for any possible catastrophe of magnitude in the future.

"FICUS" IN MALAYA.

In achieving this end it has been necessary to very largely overlook the claims of other rubber varieties for consideration from the one and only standpoint it is possible to consider such claims—namely, that of profit-earners in a resonably brief period of time between the planting up of areas under rubber and the arrival of the trees at maturity. In Malaya the earlier planters found on their opened-up properties the indigenous *Ficus elastica* in greater or smaller quantities. Some of these pioneers in rubber cultivation retained this growth for a time, induced to do so for the most part by the knowledge that the planters in the Dutch colonies, notably Java, had undertaken, under scientific direction, the cultivation of these species. Later, on what appeared to be positive proof that as a rubber yielder Ficus was in no way comparable with Hevea, and the circulation of the statement that these Ficus yields were obtainable only in annually decreasing quantities until they practically disappeared and the tree had to be rested for an indefinite period, the Malayan planters, almost to a man, decided to have nothing whatever to do with the cultivation, and proceeded to cut it out at the earliest possible moment. Knowing what we now know of some of the recently developed vagaries of Hevea in the matter of latex yield after the trees have been tapped for a few years, and the necessity of resting these trees for a certain number of months as an irreducible minimum, with the prospect in some particular instances of still longer rest periods to be faced it seems that in some ways over-haste has been shown by planters in getting rid of their indigenous Ficus. We remember, when referring to Professor Wallace's condemnation of *Ficus elastica*, adventuring the suggestion that this tendency towards systematic decrease in the latex yields of this variety might be countered by

adopting a policy of manuring the ground from or just prior to the date of the first tapping. What subsequently struck us was that possibly a too high ideal as to the tree's yielding powers during its first years of production had been set up, and there was even the possibility that in tapping Ficus in general conformity with Hevea tapping practices, the best methods of latex extraction were not being followed in this particular connection. Furthermore, there was the chance that Ficus required not only different methods of tapping but a longer time to reach commercial maturity. Under these circumstances the last-named possible objection ruled the variety out of court in competition with Hevea, which, until very lately, we have been consistently requested to consider as a tree which in the majority of instances would give us regularly increasing yields of latex year after year.

YIELDS OF HEVEA.

Events, as we have said, have shown us that this regularity of increase in yield cannot be regarded as definitely fixed, but on account of these recent failures of Hevea to give satisfactory yields, we have not yet heard of any serious proposal to cut these trees out and replace them with some other variety or perhaps some totally different cultivation. The *Ficus elastica* may deserve all the hard things that have been said of it by experts and others who have reported from time to time in the immediate past on its commercial value and prospects, and there may not be the slightest real analogy between its habit of giving decreasing yields and the recently-developed refusal of hitherto good yielding Hevea to respond satisfactorily to operations on the renewed bark areas. On the other hand, there may be an establishable analogy, and in such an event the cutting out of *Ficus elastica* in many districts of Malaya may have yet to rank in the history of cultivated rubber in the Middle East as one of those regrettable incidents which similar occurrences in some parts of Ceylon might furnish an interesting parallel.

We may have failed up to the present to develop Mr. Wicherley's enthusiasm for Ceara and its prospects when properly

planted in Ceylon, but we are far from being desirous of damping his enthusiasm or that of any other competent worker in this particular field of inquiry. Like *Ficus elastica* in Malaya, Ceara Rubber in Ceylon, given that it was at all properly planted, under satisfactory soil and climatic conditions, always has grown well. It was when it came to tapping the Ceylon Ceara so that the trees were not perished as the result of the first operation or so that the trouble with this variety arose. When we recall the atrocities in connection with tapping Hevea on many Middle East rubber estates, and remember that but for the specalisation with regard to this cultivation, to which reference has just been made, these atrocities still might be prepetrated, we find, perhaps, the most satisfactory ground for hoping that there is a sound commercial future for the Ceara varieties in Ceylon and Southern India. The rubber produced under existing tapping methods is good rubber, and when carefully prepared fetches good prices when sold at the London plantation rubber auctions. A tapping system, which Mr. Wicherey claims to have discovered, calculated to give the close-planted and rapid-to-mature Ceara a reasonable commercial life, means nothing more or nothing less than the conversion of large areas at present under this variety in Ceylon from uselessness to very profitable utility. The best tapping system which Mr. Wicherley or any other practical expert can evoke may fail to give the trees that period of life which would put them on the basis we have just indicated. But in attempting to decide, for business purposes, the extent of this period it might be well to ignore analogies obtainable from Hevea under cultivation. We have got to arrive at the time when we will regard, in a general way, 100 matured Hevea to the acre as representing rather close planting, and we may possibly have to overhaul our ideas as to what constitutes the age at which the trees, regarding them in the light of permanent profit-earning assets, can be systematically tapped. We have, however, in Ceara a rubber tree non-indigenous to the Middle East which matures with great rapidity, and can be grown with apparently perfect safety many hundreds to the acre. The problem, then, comes up as to whether one or two successful

tappings might not be regarded as representing the satisfactory commercial life of the tree, after which it could be cut down, the roots removed and these areas replanted, while from other sections of the properties income would be steadily earned from the already matured trees. We might even get along to the suggestion of an old reader of ours that, as Ceara can be brought to apparently sufficient maturity in 18 months or so no more than one season's tapping should be expected from the trees, which would then be cleared away and the procedure just outlined pursued by the estate owner. This is a matter into which we may have occasion to go more deeply in the near future, but in the meantime we wish to emphasise the opinion that we ought, when attempting any commercial plantation valuation of Ceara, to exercise exceeding care in the choice of the basis which upon such a valuation is constructed—[*Straits Budget.*]

THE LEGEND OF THE RAIN-TREE.

During the last few months American newspapers have received the well-worn tale of the "Peruvian rain-tree" which affords protection against drought. The leaves of this tree are said to have the property of condensing atmospheric moisture in large quantities and precipitating it in the form of rain. According to one writer, "the water falls from the leaves and oozes from the trunk and forms veritable rivers, which can be led as irrigating canals to any point desired. Making liberal allowance for evaporation and infiltration, a square mile grove of the trees would supply for distribution about 100,000 gallons of water daily."

On the strength of similar stories one of the trees to which the name "rain-tree" has been most often applied, viz., *Albizzia* (or *Pithecolobium*) *saman*, has lately been exploited and sold extensively in Australia. The virtues claimed for it have proved to be altogether illusory, although it is useful as a shade-tree, and is widely planted for this purpose in semi-tropical and tropical countries.

The legend of the "rain-tree" or "raining-tree" dates back to the stories of the Fortunate Isles, where no rain fell from the skies and the soil was refreshed by the moisture shed by a tree of the sort described. The early navigators brought home stories of similar trees in the East Indies, in Guinea, Brazil, etc. The Peruvian rain-tree appears to have been brought to the notice of the world by the reports of a United States Consul in Peru, about 1877. These reports were widely quoted at the time, and led the Government of India to seek information on the subject from the authorities of Kew Gardens. The investigations of W. T. Thistleton Dyer brought to light a plausible explanation of at least a part of the rain-tree stories.

The traveller Spruce reported his own experiences with the rain-tree as follows:—

"The Tamia-caspi, or rain-tree of the eastern Peruvian Andes, is not a myth, but a fact, although not exactly in the way popular rumour has lately presented it. I first witnessed the phenomenon in September 1855, when residing at Tarapoto. I had gone one morning at daybreak, with two assistants, into the adjacent wooded hills to botanise. A little after seven o'clock we came under a lowish spreading tree, from which with a perfectly clear sky overhead a smart rain was falling. A glance upward showed a multitude of cicadas sucking the juices of the tender young branches and leaves, and squirting forth slender streams of limpid fluid."

This is not the only explanation. That many plants spontaneously exude moisture under suitable conditions is well known. The phenomenon is called "guttation," and has perhaps been most fully described by A. Burgerstein in his work "Die Transpiration der Pflanzen" (Jena, 1904). The moisture drawn up from the roots of plants most frequently passes off into the air in a gaseous form, *i.e.*, by transpiration. If the air is saturated with moisture, and if the supply of moisture to the roots is copious, then liquid drops will be exuded sometimes in large quantities. Molisch records a case in which a single leaf of a species of *Colocasia* gave off 190 drops per minute. Burgerstein gives a list of 241 plants, belonging to 101 families, in which guttation has been observed.

This process goes on chiefly at night, and in cloudy and foggy weather, *i.e.*, when the relative humidity of the air is highest. It is altogether probable that in the moister parts of the tropics there are trees which exhibit this phenomenon in such a degree that the name "rain-tree" may be fittingly applied to them. It is, however, certain that no such process can occur in a dry climate, and that the proposal to plant the rain-tree as a panacea against drought is entirely chimerical.—[*Scientific American.*]

LATEST GOVERNMENT ORDERS REGARDING PRIVATE EMPLOYMENT TAKEN UP BY OFFICERS ON LEAVE.

No. 5471-*C. S. R., Government of India, Finance Department.*

RESOLUTION.

Simla, the 6th September 1911.

READ—

Resolution by the Government of India in the Finance Department, No. 2998-P., dated the 16th May 1907.

Despatch from His Majesty's Secretary of State, No. 91-Public, dated the 18th June 1909.

The Government of India consider it desirable to call attention to the orders of the Secretary of State for India requiring officers on leave out of India to obtain his sanction before taking up private employment. They have further decided to extend the authority granted to Local Governments in the Resolution above cited to permit officers on leave to accept employment outside Government service. The Governor-General in Council is accordingly pleased to revise as follows the orders contained in that Resolution.

2. The Government of India desire to repeat that inasmuch as leave is intended as a period of recreation and rest and is granted to an officer for the purpose of recruiting his health, it follows that taking up employment during leave is not permissible save in exceptional circumstances and with special sanction.

3. A gazetted officer who is in receipt of furlough or leave allowances must obtain, if he is resident out of India, the previous

sanction of the Secretary of State or if resident in India, that of the Local Government, or (if he is serving under the Government of India) of Government of India, before taking service under an employer other than Government or accepting any employment not being under Government, which involves the receipt of a fee or honorarium.* In the case, however, of a non-gazetted officer resident in India the special permission of the officer empowered to appoint him may be accepted as sufficient authority.

4. The orders contained in the preceding paragraphs refer to the acceptance of employment of any description whatever, not being employment of the kind for which the Foreign Service Rules in Part VII of the Civil Service Regulations provide. An officer in receipt of leave allowances cannot take up an appointment which is such as should, for public reasons and not merely in his own interest, be filled by a servant of Government, unless he has been transferred thereto in the regular way by the authority empowered to authorise his transfer under the rules regulating transfers to Foreign Service. An officer who has been so transferred ceases, from the date on which he takes up the appointment, to be on leave and is no longer entitled to draw leave allowances from Government. He becomes an officer in active service drawing from his employer pay fixed in accordance with rule.

Order.—Ordered that this Resolution be communicated to all Local Governments and Administrations, to the several departments of the Government of India, to the Heads of Departments subordinate to the Finance Department, to the Comptroller and Auditor-General, and to all Accountants-General and Comptrollers, Examiners and Government Examiners of Railway Accounts, and the Examiner of Accounts, Military Works Services, for information.

Ordered also, that this Resolution be published in the Gazette of India.

(Sd.) J. S. MESTON,
Secretary to the Government of India.

* NOTE.—This condition is not to be held to apply to the receipt of fees for literary work, or for service as an Examiner, or to simila employment.

AMENDMENT TO THE INDIAN FOREST ACT.

GOVERNMENT OF INDIA, LEGISLATIVE DEPARTMENT.

The following Act of the Governor-General of India in Council received the assent of the Governor-General on the 18th September 1911, and is hereby promulgated for general information :—

ACT NO. XV OF 1911.

An Act further to amend the Indian Forest Act, 1878.

Whereas it is expedient further to amend the Indian Forest Act, 1878 *; It is hereby enacted as follows:—

Short title.

1. This Act may be called the Indian Forest (Amendment) Act, 1911.

Amendment of section 2, Act VII, 1878.

2. In section 2 of the Indian Forest Act, 1878, in sub-clause (*a*) of the definition of "forest-produce," after the words "mahua flowers" the words "mahua seeds" shall be inserted.

Amendment of section 26, Act VII, 1878.

3. In section 26 of the said Act, for the words "with the previous sanction" the words "subject to the control" shall be substituted.

Amendment of section 31, Act VII, 1878.

4. In section 31 of the said Act, after the words "from time to time" the words "and subject to the control of the Governor-General in Council" shall be inserted.

Amendment of section 39, Act VII, 1878.

In section 39 of the said Act—

(*a*) for the words "with the previous sanction" the words "subject to the control" shall be substituted;

(*b*) after sub-clause (*b*) the following proviso shall be inserted, namely :—

"Provided that a notification directing the levy of a duty in the case of timber and other forest-produce brought, from any place beyond the frontier of British India, which is not under the control of the Local Government, shall not be issued without the previous sanction of the Governor-General in Council"; and

* VII of 1878.

(*c*) for the words "with the like sanction" the words "subject to the like control or sanction, respectively," shall be substituted.

Repeal of proviso to section 77, Act VII, 1878.

The proviso to section 77 of the said Act is hereby repealed.

CORRESPONDENCE.

TO THE HONORARY EDITOR, INDIAN FORESTER.

THE TRAINING OF INDIAN FOREST OFFICERS.

SIR,—We have heard a good deal lately about the training of Forest Officers. The old custom of educating them together has been abandoned, and they are in future to be trained separately at various centres, under the eye of the Director of Forest Studies. That this system appears to be a bad one, few who have the interests of Indian forestry at heart will deny, abolishing by a stroke of the pen, as it does, the *esprit de corps* and Indian atmosphere which obtained at Nancy, Coopers Hill, and to a certain degree, I suppose, at Oxford also. At the same time we have to recognise that the system is at any rate to be given a trial for a few years, and we must make the best of it.

It is some consolation to know that the Director is to be an Officer of the Indian Forest Service. Whether his duties have as yet been definitely laid down or not I do not know, but presumably one of his first acts will be to overhaul thoroughly the curricula laid down for Forest Probationers at the Universities which Government has appointed for the training of Indian Forest Officers, with the object of making any alterations he thinks necessary with a view to bringing them into line or for any other reason. In doing so the question will naturally occur to him whether the education given to Forest Probationers during the last few years could not be improved in any way. Regarding the course at Oxford I am not in a position to speak, but I am sure that the training at Coopers Hill was susceptible of improvement in one

or two particulars. Sir William Schlich and his staff at Coopers Hill have no warmer admirer than myself; I count it an honour to have been one of his pupils, and I should be exceedingly sorry if he were to think that any remarks I may make were conceived in any spirit of hostility to him or his methods, as this is very far from being the case. He will, however, I expect, admit that nothing in this world is perfect, and to me and I believe to other Forest Officers also, it seems that there were some points in the Coopers Hill Forest course which could be bettered. After all the test of the excellence or otherwise of any curriculum lies in its practical application, and my experience at any rate leads me to think that the teaching of engineering and science and the arrangements for the practical work in Germany call for the Director's special attention. I offer the following remarks on these subjects for what they are worth :—

ENGINEERING.

It is some years now since I left Coopers Hill and I have not a copy of the curriculum to which I can refer, but if my memory serves me right very little engineering at all was included in the course, and this is all the more surprising in view of the fact that Coopers Hill was chiefly an engineering college. We were, I think, given a few notes on the subject, for I recollect dear old "Dicky" drawing pictures of various kinds of brick bond on the blackboard, but this is the one fact which leaps to my memory after the lapse of years. Of practical engineering I feel sure there was none at all, and I imagine that the case at Oxford is still the same, for one of the recent recruits asked me how to lay out a road, and declared that if he were ever called on to make a road he should have to send in his papers at once! No doubt he was merely displaying a pretty humour, but the fact remains that neither I at Coopers Hill nor he at Oxford were given adequate practical instruction in making various kinds of roads, and I can well remember how diffident I felt the first time I had to make a road through difficult country.

Of course there is no need for a Forest Officer to be a highly trained engineer, but he should certainly have a good practical

knowledge of simple engineering works. He should know, for instance, how to burn lime and bricks, how to design and build simple bungalows, how to make estimates for various kinds of works, how to make roads and small canals, how to construct simple bridges, and various other things. I believe the Ranger classes at Dehra Dun have an extended course of engineering, both theoretical and practical, and the Forest Probationers at Home should certainly have one too. They cannot of course acquire much of a knowledge of Indian trees and other kindred matters until they arrive in the country, but they can learn practical engineering at Home just as well as out here. Personally I have often felt my lack of knowledge of practical engineering, and although one picks up a certain amount out here, and in fact has to, yet I feel strongly that this is not one of the subjects which a Probationer should be left to learn as best he can when he arrives in the country. He then finds plenty of other subjects to engage his attention.

SCIENCE.

The Science course at Coopers Hill included a certain amount of higher mathematics (statics and hydrostatics), physics, chemistry, botany, entomology, and geology. None of these subjects were optional ; on the contrary they were all included in branches of subjects in which it was necessary to obtain a requisite number of marks in order to qualify. Statics and hydrostatics were, I believe, latterly knocked on the head, but even their belated removal left five branches of science, a fairly complete knowledge of which was supposed to be acquired in two years! Considering that this was in addition to all the other subjects—Forestry in all its branches, Surveying, Drawing, German, and so on—the feat must be considered as an almost impossible one for any ordinary man who entered Coopers Hill with no previous knowledge of science. In consequence what happened in many cases was that what should have been an interesting and profitable study developed into a wild struggle against awful odds to obtain the number of marks necessary to qualify. Many of us thus came to look on some of these sciences as enemies whose object was to endeavour

to keep us out of the service instead of as friends whose design was to help us in our future careers. Personally I passed into the Forest Service chiefly by the aid of classics and an ordinary Public School education which did not include science. On my arrival at Coopers Hill I found these five branches of science confronting me, with statics and hydrostatics in addition. After the first few lectures (some of them exceedingly uproarious ones !), I recognised that it was quite impossible for me to take an intelligent interest in them all, and, try as I would, I remember that the first term I was vanquished by my enemies, chemistry and botany, failing to obtain the necessary number of qualifying marks. Thenceforth I hated these two subjects with a deadly hatred, and my subsequent efforts, which were successful, were directed not to studying these subjects with any interest but to cramming them up in order to obtain the required number of marks. I have quite a friendly feeling for physics, and especially "phy. lab.," so probably I did fairly well in that, and I expect I was immense at weighing hairs with marvellous accuracy and other experiments of that sort, which, although they were excellent for the purpose of gaining marks, have been absolutely useless to me out here.

The fact is that at Coopers Hill we were expected to do far too much science in too short a time. Of course a number of men had done a certain amount before entering the college, and for them things were easier, but on the other hand a number like myself had not. I do not at all complain that the time devoted to science at Coopers Hill was too long, but that an endeavour was made to cram too much into that time. Botany is a subject, for instance, in which I should much like to excel, and had I been allowed to spend half the time devoted to science to botany alone I might have become interested and proficient in it. I do not of course wish for one moment to cast reflections on Dr. Groom's teaching; he had no doubt to get through a certain amount in a short time; and I am sure he tried to make it as interesting as he possibly could.

The question then arises, how much science is it necessary for a Forest Officer to know? We may admit at once that all the

above-mentioned branches of science have a certain bearing on Forestry, but we must also confess that it is by no means necessary for every Forest Officer to be an expert in each one of them. We may, I think, go further still and say that a Forest Officer will be none the worse officer for being an expert in none of them. Botany would perhaps seem to be the most necessary from a forest point of view, but I believe that even the German schools assign a subordinate position to botany in the Forest Officer's training, and recognise that a thorough knowledge of the science is not indispensable. He must of course have an elementary knowledge of botany, but I think that if Indian Forest Officers were asked to state of what practical use to them have been the long hours they spent gazing through microscopes, the large majority of them would say of none at all. The teaching of the other branches of science might be criticised on the same principle.

No doubt the teaching of science at the Universities is very different to what it was at Coopers Hill, and very likely the science course at present laid down for Forest Probationers is beyond criticism. I do not know whether this is so or not, and the matter is no doubt one to which the Director of Forest Studies will give his attention. The best thing would seem to be to insist on one or two branches of science, such as botany or geology, being thoroughly mastered, and to arrange for a series of lectures which would include only those elementary details of the remaining branches with which it is necessary for a Forest Officer to have some acquaintance.

THE TOUR IN GERMANY.

I have no desire to dispute in any way the excellence of the general teaching of Forestry at Coopers Hill, but I think that there are one or two points in the German tour which, if the tour is still conducted on the same lines as it was in the old Coopers Hill days, may require the Director's attention. We used to be sent in pairs to different parts of Germany, and we lived either with the Forstmeister or at the village inn for some six months or more, and at the end of that time Dr. Schlich, (as he then was), used to

take us a tour through various other forests. Now I do not think the first part of the arrangement was as satisfactory as it might have been. No doubt a very great deal depended on the Forstmeister under whose tuition one was placed, and there may be many whose experience was different to mine, and who may entirely disagree with what I am about to say. I am however, able to write of my experience alone, and that this was the experience of other men in other years, who were sent to the same place I know for a fact.

The experience of myself and my companion, then, was that, in spite of our thirst for knowledge, we acquired very little that we did not pick up for ourselves, and that the Forstmeister hardly attempted to teach us anything. He was a nice old chap, and a thorough sportsman, and we were both quite fond of him, but the mere fact of him being all this did not in any way add to our knowledge of practical Forestry. In a word we really did not know what to do with ourselves. We used to ask him every day what we should do, and he generally replied, "Oh, go for a short walk in the forest if you like," and this was our usual occupation. Very occasionally he used to come with us and point out matters of interest, and sometimes he took us to an auction, leaving us most of the time in the next room with glasses of port with which he most thoughtfully provided us. We also indulged in rather fruitless "Hasenjagd" with himself and his subordinates, and occasionally we used to watch him slay the red deer. Many days were spent in "Holz-aufnahme," which was merely unpleasant and taught us nothing at all, and, in short, I look back on the first part of my sojourn in Germany with very little satisfaction. Some practical experience of course we did gain, but we both felt we might have learnt very much more if we had been properly instructed.

Sometimes we very nearly made up our minds to write to Dr. Schlich and complain that we were being taught nothing and only refrained from doing so because we did not wish to bother him or to give away the Forstmeister, whom we genuinely liked and who was kindness itself. The system was no doubt the best that could

have been adopted under the circumstances, for of course Dr. Schlich had to be at Coopers Hill lecturing to the other students, but in future it seems likely that the Director will be able to keep in more personal touch with the men abroad, and this is, I am sure necessary, if they are to reap the full benefit of their stay on the Continent.

O. C. H.

THE RATE OF GROWTH OF *HARDWICKIA BINATA*.

SIR,—In Volume II, Part III of the *Indian Forest Records*, there is an interesting note on "The Sylviculture of *Hardwickia binata*."

On page 97 it is stated that the length of time taken to produce the leading shoot is not less than 10 years, and again on page 102 it is estimated that a sapling 10 feet high would be 20 years old.

In the Rayachoti Reserve of Bellary District sowings were made in coupe I in 1906.

In 1908 one tree produced a leading shoot. That tree is now 9 feet high and 10½ inches in girth.

In addition no less than 121 seedlings of 5 years old have produced leading shoots of 3 to 9½ feet high.

The following table shows the measurements taken by Ranger Thamboo Naidu on the 6th August 1911 :—

No.	Height of shoot.
2	9½′
6	9′
21	6′ to 8′
20	4′ to 8′
7	5′ to 6′
8	4′ to 5′
22	3′ to 5′
23	3′ to 4′
12	3′

Groups of saplings were evidently measured. It seems evident from these figures that the slow growth in the early years attributed to this tree is by no means universal.

In the Kupgal Reserve I measured in July a row of trees taken haphazard in the plantation of 1893 (18 years old), whose height ranges from 15′ to 18′:—

No.	Girth measurement.	Remarks.
1	... 12½″	
2	... 15″	
3	... 12″	
4	... 10″	... Double stem.
5	... 17″	
6	... 12″	... Do.
7	... 14″	... Do.
8	... ...	... Broken.
9	... 17″	
10	... 16″	

I also found in the 1895 and 1896 plantations that the height was 10 to 20 feet, though I took no actual measurements. These areas also seem to show that the growth is more rapid than is supposed.

My inspection was necessarily a hurried one and I write this to show that in Bellary District there is an excellent field for observation of the growth of trees, whose age is known. The local officers can easily supp'ement this note by recording actual measurements.

P. M. LUSHINGTON,
Conservator of Forests, N. C.

WALTAIR:
23rd September 1911.

THE COPPICING POWERS OF BABUL.

SIR,—In reply to Mr. Maitland-Kirwan's enquiry on the above subject in the August issue of the *Indian Forester* I would state that my experience in Southern India is that coppice shoots cannot be relied on with this species.

I believe that one or two working-plans were once framed that provided for regeneration by coppice shoots, but had subsequently to be modified.

I also find my view supported by Mr. C. E. Brazier, I.F.S., who, when District Forest Officer of Tinnevelly, recorded that this species does not produce coppice shoots from stumps over 5 to 6 inches in diameter, but that reproduction from seed is abundant.

This exactly corresponds with my own observations.

CAMP KAVUNJI,
MADURA DISTRICT:
22nd September 1911.

C. E. C. FISCHER,
Deputy Conservator of Forests.

THE GROWTH OF PALMYRAS.

SIR,—There was considerable correspondence on the above subject in the pages of the *Indian Forester* a few months ago. As they seemed to be of a somewhat theoretical ature, I attempted to collect some notes on the subject from a practical point of view.

My district at that time—Central Coimbatore—comprised both very moist (a section of Malabar) and very dry (Erode Taluk of Coimbatore) portions, and it seemed a favourable opportunity of studying the tree under both conditions. I also questioned some practical growers in Malabar.

In the Erode portion we have seen dibbling in Palmyra seeds in one reserve since 1907 with fair success and I had intended making a careful inspection of these plants, but was transferred just before my intended visit. I have obtained information, however, from the Ranger, Mr. A. P. Srinivasa Aiyengar.

Notes from Malabar given by a land-owner (rainfall about 100 inches).

If not interfered with, a definite stem appears above ground in six years and begins producing fruit in nineteen years. The life of the tree is about that of a man—50 to 60 years.

He went on to say that there is a great difference if the trees are looked after and protected, as they are much damaged and retarded when exposed to injury by cattle.

He has two plantations both from seed dibbled in *in situ* nineteen years ago. The one was protected and the other not. In the former the trees are now 16 to 18 feet high and some have produced fruits and he expects all to be in bearing in another four years.

In the unprotected area the trees are only 5 feet high.

Notes furnished by Ranger Srinivasa Aiyengar for Erode (rainfall 20 inches).

In well-ploughed land a stem appears above ground in two years, in superficially ploughed land in three years.

In our plantation, however, where there was no ploughing, there is as yet no sign of a stem in the oldest plants which are four years old. Apparently plantations should be ploughed once or twice a year.

(*Note.*—I suspect that the early appearance in the first two cases may refer to irrigated plantations.)

The fruit appears first after 35 years on trees grown in dry situations and after 25 to 30 years in favourable situations where there is considerable moisture.

The age at which the tree becomes useless is apparently rather mythical. One report says 250 years and there is also a Tamil saying that under favourable circumstances the tree survives for 1,000 years.

The Ranger furnishes the following additional items which are of interest :—

Sowing should be during South-West or North-East monsoon.

(Here South-West, end of June to August; North-West, October and November.)

Germination takes place in one month. The fresh leaf appears above ground in three months. A first leaf appears every month thereafter.

Leaves may be cut for the several uses they are put to from the time the stem appears above ground. They are cut at the end of September or in October.

Leaf sheaths fit for fibre for brushes may be obtained after five years' growth.

In early life the rate of height growth of the stem is from 12 to 18 inches a year. This rate diminishes gradually till the full height is reached.

Juice for *toddy* or *jagari* is extracted from the female tree from January to April and from the male in November and December. In the females when extracting juice 10 leaves are left on the tree and in the males but 4 or 5, as the incisions for tapping are made higher up the stem.

CAMP KAVUNJI,
MADURA DISTRICT:
22nd September 1911.

C. E. C. FISCHER,
Deputy Conservator of Forests.

OBITUARY.

CHARLES FREDERIC ELLIOTT.

We regret to record the death of Mr. C. F. Elliott' which occurred very suddenly on the 4th September 1911 at Godstone, England. Mr. Elliott, who was sixty-four years of age, spent all his service in the Punjab, chiefly in Multan and Rawalpindi, and was Conservator of the Province from 1894 to 1903, when he retired under the age limit. After retirement he was appointed Conservator of Forests in British East Africa, which post he held for four years. In 1884 he spent a year studying Forestry at Nancy, while on furlough. Mr. Elliott was a man of a most kindly disposition and lovable nature, and is held in affectionate memory by many in the Punjab, both European and Indian.

WILLIAM HENRY REYNOLDS.

There passed away at his residence, The Birches' Walton-on-Thames, on the 21st September 1911, in the person of Mr. W. H. Reynolds, one who for many years was well known throughout the Forest Department as Superintendent of Forest Surveys. Mr. Reynolds' service dates from 1861, when he joined the Survey of India. In 1871 he was transferred to the Forest Department as Assistant Conservator of Forests, becoming Deputy Conservator, 2nd grade, and Superintendent of Forest Surveys in 1887: the latter post he held until his retirement in 1900. Mr. Reynolds was for many years a prominent member of Dehra Dun society, and was known among his numerous friends as a man of a most genial and hospitable temperament. His shrewd business ability enabled him to carry on with great success the work of the Forest Survey branch, for the administration of which he was for so many years responsible. In the early years of his service Mr. Reynolds acted as Assistant Surveyor with the Umbeyla Expedition, October to December 1863, and was present at the destruction of Malka, receiving a medal with N.-W. Frontier and Umbeyla clasps. He was 68 years of age at the time of his death and had been ailing for some time. We offer our sincere condolences to his family.

NOTES.

The identity of Pyinkado wood.—Tabula 2932 (of 1911) of Hooker's *Icones Plantarum* describes *Xylia Kerrii*, Craib and Hutchinson, which differs from *X. dolabriformis*, Benth., in having the leaves velvety beneath and the anthers eglandular. According to specimens at Kew, *X. Kerrii* occurs in Burma (Tharrawaddy District, *Lace*, 2780). In view of the doubt which exists at present regarding the identity of the Burmese *pyinkado*, botanical specimens and samples of wood have been asked for by the Forest Botanist from different localities in India and Burma where *Xylia* occurs, and the result of the investigation will, it is hoped, clear matters up.

Marathon Race at the Forest College, Dehra Dun.—The annual Marathon Race at the Forest College was held on the morning of the 21st October 1911, the course, as in previous years, being from Dehra Dun to the Mohand tunnel and back, a distance of about 15½ miles, the finish being at the President's house. There were 23 starters, many of whom, however, did not complete the course. The winner was Rai Singh (1 *h.* 54 *m.* 40 *s.*), Mukerji (1 *h.* 54 *m.* 50 *s.*) being a very good second. The subsequent order of the prize winners was as follows :—(3) Hira Singh, (4) Allayar Khan, (5) Belliappa, (6) Bishan Singh, (7) Jayanand, (8) Sharma.

N.-W. R. Timber Sleeper Renewals.—It is believed that the North-Western State Railway are replacing the existing wooden sleepers in the Bhatinda-Raewind section, Ferozepore district, with new Indian timber sleepers ; and are also improving the standard of the track. On the Southern Punjab Railway the decayed Australian sleepers in the Bhatinda and Ferozepore districts are being renewed with new deodar sleepers and bearing plates.—[*Indian Engineering.*]

Hockey at the Forest College, Dehra Dun.—The Mussoorie Hockey Tournament has been won by the Forest College, who beat the Survey "A" team by 7 goals to *nil* in the final last week. In the earlier stages of the tournament the Band beat the Gunners by 3 goals to 2, Survey "A" beat St. Fidelis by 3 to 2 and Forest College beat St. George by 4 to *nil.* In the semi-finals Survey "A" beat the Band 2 to 1 and the Forest College beat Oakgrove by 4 to 1. The *Indian Field* remarks that the winners are a team of unusual excellence, and would hold their own in any of the big tournaments in India.

The team was as follows :—J. Campbell (goal), R. Finney and E. Peacock (backs), D. Monro, C. Mapp and G. Turner (half-backs), S. Mukerji, D. McDonald, L. O'Hara, Moor, and Hira Singh (forwards.)

THE CORONATION DURBAR HONOUR'S LIST.

We are glad to observe that the following members of the Forest Department figure on the Honour's List:—

K. C. I. E. ... Mr. St. H. Eardley-Wilmot, late Inspector-General of Forests. Considering the services rendered by Mr. Wilmot to the Department, we are surprised that this honour was not accorded to him before.

C. S. I. ... Mr. Beadon-Bryant, Inspector-General of Forests. This is the first time that a C. S. I. has been given to a member of the Department.

C. I. E. .. Mr. Murray, late Senior Conservator of Forests, Bombay, and Mr. Hart, Chief Conservator of Forests, Central Provinces.

K.-i.-H. .. Mr. Hodgson, Deputy Conservator of Forests, Bombay, and Mr. Bonig, Extra Assistant Conservator of Forests, the Andamans.
Gold Medal.

Silver Medal .. Mr. Clutterbuck, Officiating Conservator of Forests, United Provinces, and Mr. Langhorne, Extra Assistant Conservator of Forests, Central Provinces.

The following honours have been awarded to Indian members of the Department :—

Rai Bahadur . Mr. Sadanand, Extra Deputy Conservator, United Provinces.

Mr. Paranjpe, Extra Deputy Conservator, Central Provinces.

Rai Sahib .. Mr. Nand Mal, Extra Deputy Conservator, United Provinces, attached to the Imperial Forest Research Institute and College.

Mr. Tarak Brahma Biswas, retired Extra Assistant Conservator, Bengal.

Ranger Manohar Singh, United Provinces.

Khan Sahib ... Mr. Imamuddin, Extra Assistant Conservator, Punjab.

Ranger Jafar Hussain, United Provinces.

A.T.M. (Burma) Maung Tun Tha, Extra Assistant Conservator.

VOLUME XXXVIII NUMBER 2:

INDIAN FORESTER

FEBRUARY, 1912.

[*Circular No. 27-F.-267-3, Government of India, Department of Revenue and Agriculture, (Forests), dated Simla, the 23rd October* 1911.]

INDIAN FOREST SERVICE.

REGULATIONS AS TO THE APPOINTMENT OF PROBATIONERS, 1912.

1. *Appointments.*—The Secretary of State for India in Council will, in the summer of 1912, make *not less than five appointments* of Probationers for the Indian Forest Service, provided that so many candidates are considered to be in all respects qualified.

In making these appointments, he will act with the advice of a Selection Committee.

2. *Applications for Appointment.*—Applications for appointment must be made on a printed form to be obtained from the Secretary, Judicial and Public Department, India Office, Whitehall, London, S. W., and to be returned to him not later than *Monday, the 1st July* 1912. Candidates must be prepared, if called upon, to attend at the India Office, at their own expense, for a personal interview with the Selection Committee within three weeks from that date.

3. *Age Limit.*—Candidates must be not less than 19 but under 23 years of age on the 1st July 1912.

Notice is hereby given that the age limits for the recruitment of 1913 *and following years will be* 19 *and* 22 *years on the* 1*st* January *of the year in which the selection is made.*

4. *Nationality, etc.*—Every candidate must be a natural-born British subject. He must be unmarried, and if he marries before he reaches India he will forfeit his appointment. He must be of good physique, and must produce evidence of character to satisfy the Secretary of State for India in Council that he is suited for the Indian Forest Service.

5. *Qualifications.*—Candidates must be able to show that in addition to having received a good general education they have passed with honours in a public examination for a degree in some branch of Natural Science held by a University in Great Britain or Ireland. A good general education should be understood to include, at the least, a fair knowledge of English Composition, Mathematics up to and including Plane Trigonometry, and either German or French. The production of school certificates granted by the examining authorities of Universities, or of certificates that a candidate has passed the Matriculation Examination of a University, in the subjects named, or of other certificates held by the Secretary of State in Council to be equivalent, will be taken to show that a candidate satisfied the requirements of this clause.

6. Should there be more candidates considered to be qualified in every respect than vacancies to be filled, the Secretary of State reserves the right to require them to pass a competitive examination conducted by the Civil Service Commissioners, on the result of which their final selection would depend. Particulars of this examination, which would be held in August, will be found in Appendix I.

7. *Medical Examination.*—Selected candidates will be required to undergo a strict examination by a Medical Board at the India Office, at which particular stress will be laid on good vision and hearing, and to satisfy the Secretary of State for India that

they are physically fit for service in the Indian Forest Department (*see* Appendix V).

Candidates who do not satisfy the Secretary of State for India that they are physically fit for appointment to the Indian Forest Service will not be admitted to the competitive examination mentioned in Regulation 6.

8. *Period of Probation.*—The ordinary period of probation will be two years. During that time probationers will be required to pass through the Forestry course at one of the Universities named below * becoming members of that University if not so already; to obtain the Degree or Diploma in Forestry which it grants; to acquire some knowledge of Hindustani; and to satisfy such other tests of proficiency as may be deemed necessary. The case of students who have already obtained such degree or diploma at any of the above-named Universities will be specially considered in each case.

During the vacations the probationers will, under the direction and supervision of the Director of Indian Forest Studies appointed by the Secretary of State for India in Council, receive practical instruction in such British and Continental forests as may be selected for the purpose.

9. *Charges.*—The probationers will be required to defray all expenses of lodging, board, tuition, and excursions, while at the University, and on practical instruction in Britain and on the Continent, with the exception of fees payable to local Forest Officers in Britain and on the Continent.

10. *Allowances.*—The Secretary of State for India in Council will make payments to each probationer at the rate of 120*l.* annually, not exceeding a total of 240*l.* (besides the fees to local officers mentioned above). These payments will ordinarily be made on the following dates in each year :—

	£
On the 1st December	30
On the 1st March	30
On the 1st June	60

* Oxford, Cambridge, Edinburgh.

The cases of probationers whose probation does not extend over the full two years will be specially considered.

The grant of the allowances is subject to the following conditions :—

(*a*) that the progress of the probationer in his studies satisfactory ;

(*b*) that the probationer gives security to refund the payments in case he fails to join the Indian Forest Service at the end of the period of probation.

11. *Conduct.*—Every probationer will be required to conduct himself during the period of probation in a manner satisfactory to the Secretary of State, and to give evidence of satisfactory progress in his studies in such a manner as may be required, failing which, or in the event of serious misconduct, he will be liable to have his name removed from the list of probationers.

12. *Appointment and Seniority.*—Probationers who obtain a Degree or Diploma in Forestry, and are of sound constitution and free from physical defects which would render them unsuitable for employment in the Indian Forest Service, will be appointed Assistant Conservators in the Indian Forest Department. Their position in the Provincial Forest Lists will be determined by the Secretary of State for India in Council on the Report of the Director of Indian Forest Studies ; but in making selections for the post of Conservator, officers joining the service in the same year are reckoned as equal in seniority, unless the Secretary of State for India in Council shall for special reasons have directed otherwise in any particular case or cases.

They will be allowed at the end of the period of probation to state their preference in respect to the Provinces to which they desire to be allotted ; but the distribution will be made to the several Provinces according to the needs of the public service, at the discretion of the Secretary of State for India. Officers are, however, at all times liable to be transferred from one Province to another at the pleasure of the Government of India.

13. *Riding.*—Every probationer, before proceeding to India, will be required to satisfy the Secretary of State, in such manner as may be determined, of his ability to ride.

14. *Articles of Agreement.*—Within a month of his nomination as Assistant Conservator, each nominee must sign articles of agreement describing the terms and conditions of his appointment; he must embark for India when required to do so by the Secretary of State, and must engage his own passage. Failure to embark at the stated time will, in the absence of satisfactory explanation, lead to forfeiture of appointment.

15. *Salary.*—An Assistant Conservator of Forests will draw pay at the rate of Rs. 380 a month (equivalent to 304*l.* a year, when the rupee is at 1*s.* 4*d.*) from the date of his reporting his arrival in India.

16. *Promotion, Leave, Pension, and Provident Fund.*—Promotion, leave, and pension will be governed by the Regulations laid down by the Government of India, and applicable to Forest Officers, such regulations being subject to any modifications or alterations which may be made in them from time to time by the Government of India, and their interpretation in case of any doubt arising being left to that Government. A copy of the existing regulations can be seen on application at the India Office.

Certain information regarding appointments in the upper controlling staff of the Indian Forest Service, the pay of which has been recently improved, will be found in Appendix II; a summary of information regarding Leave is contained in Appendix III; and regarding Pensions and the Provident Fund in Appendix IV.

INDIA OFFICE:
29th August 1911.

APPENDIX I.

COMPETITIVE EXAMINATION.

In the event of the Civil Service Commissioners being requested by the Secretary of State for India in Council to hold an examination in any year of candidates nominated by him to compete for appointment as probationers for the above Service, the following will be the subjects in which such candidates will be examined:—

1. English Composition.
2. German *or* French.
3. Chemistry.
4. Physics.
5. Geology.
6. Botany.
7. Zoology.

Not more than two of the subjects numbered 4 to 7 may be offered.

Candidates must pass to the satisfaction of the Civil Service Commissioners in the first three subjects.

In the subjects numbered 3 to 7, only marks showing real attainment will be counted towards the order of merit, so that a candidate who has a thorough knowledge of one of the optional subjects may obtain on that subject alone as many marks as a candidate who offers two of the optional subjects on a lower standard.

SYLLABUS.

Languages.—The examination in German and French will include translation, composition, and conversation.

Sciences.—The standard of the examination in Chemistry, Physics, Geology, Botany, and Zoology will be that of the Honours Schools of the Universities.

APPENDIX II.

LIST OF APPOINTMENTS OPEN TO MEMBERS OF THE IMPERIAL BRANCH OF THE INDIAN FOREST SERVICE.

[NOTE.—This list is liable to alteration at any time.]

	Appointment.	Rs.	Salary.
1	Inspector-General of Forests ...	2,650	a month.
*1	Assistant Inspector-General of Forests.	———	
2	Chief Conservators (Burma and Central Provinces).	2,150	„
20	Conservators in three grades ...	1,900 1,700 1,500	„ „ „ respectively.

The appointments of Conservator and Deputy and Assistant Conservator are allotted to the various provinces as follows :—Burma, 65 ; Madras, 28 ; Bombay, 27 ; Central Provinces, 24 ; Bengal, 11 ; United Provinces, 19 ; Punjab, 12 ; and Eastern Bengal and Assam, 18.

* The officer holding this appointment draws in addition to the pay of his grade a minimum local allowance of Rs. 200 a month.

184	Deputy and Assistant Conservators.	*Rs. 380 a month, rising by annual increments of Rs. 40 a month to Rs. 700 a month; thereafter, by annual increments of Rs. 50 a month to Rs. 1,250 a month, in the twentieth year of service.
5	Foreign Service appointments.	
†6	Officers employed at the Forest Research Institute and College, Dehra Dun.	

APPENDIX III.

(*See paragraph* 16 *of the Regulations.*)

LEAVE.

1. The following is a summary of the principal regulations relating to the leave admissible to officers appointed to the Indian Forest Service by the Secretary of State from the United Kingdom.

Long leave.

2. Furlough and special leave with allowances (*see* paragraph 6) are admissible to an aggregate maximum amount of six years during an officer's service. The amount of furlough "earned" is one-fourth of an officer's active service, and the amount "due" is that amount less any enjoyed.

3. Furlough without medical certificate can, if due, be generally taken after eight years' active service, and again after intervals of not less than three years' continuous service. It is limited to two years at a time.

4. Furlough on medical certificate may be granted (*a*) to an officer who has rendered three years' continuous service, for not more than two years, but capable of extension up to three years; and (*b*) to an officer who has not rendered three years' continuous

* Until he has passed the prescribed Departmental examinations, an Assistant Conservator may not draw pay at a higher rate than Rs. 460 a month. On passing the examinations he will resume drawing pay under the time scale at the rate to which his length of service entitles him.

† These draw a local allowance of Rs. 150 a month in addition to their grade pay, with the exception of the Principal of the College, in whose case the allowance is at the rate of Rs. 200 a month.

NOTE.—Under the improved scale of salary shown above, no Exchange Compensation Allowance is granted.

service] up to one year in any case, and up to such longer period, if any (but not exceeding two years in all), as the officer may have furlough "due" to him.

5. The allowances admissible during furlough are :—

(1) During the first two years of furlough without medical certificate and during so much of furlough with medical certificate as may be "due"—half average salary, subject to certain maximum and minimum limits.

(2) After the expiration of the period for which the foregoing allowances are admissible—one quarter of average salary, subject to certain maximum and minimum limits.

6. Special leave may be granted at any time for not more than six months, with intervals of six years' service ; allowances, calculated as during furlough, are given during the first six months only, whether taken in one or more instalments.

Short leave.

7. Privilege leave is a holiday which may be granted to the extent of one-eleventh part of the time that an officer has been on duty without interruption ; and it may be accumulated up to three months, earned by 33 months' duty. During privilege leave, the officer retains a lien on his appointment, and receives the salary which he would have received if on duty. An interval of not less than six months must elapse between two periods of absence on privilege leave.

Privilege leave may be prefixed to furlough, special leave, or extraordinary leave without allowances. The whole period of leave thus taken in combination is known as combined leave. Combined leave may not be granted for a period of less duration than six months, nor, except on medical certificate, may it be extended beyond two years.

8. Subsidiary leave in India for a minimum of ten days, usually with half average salary, is granted to an officer proceeding on or returning from leave out of India, or on retirement, to enable him to reach the port of embarkation or to rejoin his appointment. It

is admissible only at the end and not at the beginning of combined leave.

9. Short leave is also granted to enable officers to appear at examinations, etc.

10. Extraordinary leave without allowances may be granted in case of necessity, and, except in certain specified cases, only when no other kind of leave is by rule admissible. It may be granted in continuation of other leave.

General Rules.

11. Leave of absence, whether on furlough or on privilege leave, can never be claimed as of right, and is given or refused at the discretion of Government.

12. After five years' continuous absence from duty, an officer is considered to be out of the employment of Government.

13. When leave allowances other than privilege leave pay are paid at the Home Treasury, or in a Colony where the standard of currency is gold, rupees are converted into sterling at the rate of exchange fixed for the time being for the adjustment of financial transactions between the Imperial and Indian Treasuries, unless any other rate has been exceptionally authorised. But for the present the rate of conversion is subject to a minimum of 1*s.* 6*d.* to the rupee. Privilege leave pay when issued from the Home Treasury (this is only admissible when privilege leave is combined with other leave) is converted at 1*s.* 4*d.* to the rupee.

APPENDIX IV.

(*See paragraph* 16 *of the Regulations.*)

PENSIONS AND PROVIDENT FUND.

1. The following is a summary of the principal pension rules applicable to officers of the Indian Forest Service appointed by the Secretary of State from the United Kingdom:—

An officer of the Indian Forest Service is eligible for a pension on voluntary retirement after completing 20 years' qualifying service or attaining the age of 55 years. If at an earlier date he is compelled to retire from the service through ill-health, not occasioned by irregular or intemperate habits, he becomes eligible

for an invalid pension or a gratuity according to the length of his service.

The amount of pension or gratuity is regulated as follows :—

After a service of less than 10 years, an invalid gratuity not exceeding one month's emoluments for each completed year of service.

After a service of not less than 10 years an invalid pension not exceeding the following amounts :—

Years of completed service.	Maximum limits of pension.
	Rs.
10	1,000 a year.
11	1,400 ,,
12	1,800 ,,
13	2,200 ,,
14	2,600 ,,
15	3,000 ,,
16	
17	
18	
19	

After a service of not less than 20 years, a retiring pension not exceeding the following amounts :—

Scale of pension.

Years of completed service.	Sixtieths of average emoluments.	Maximum limit of pension.
		Rs.
20 to 24	30	4,000 a year.
25 and above		5,000 ,,

Officers who have shown special energy and efficiency during an effective service of three years as Inspector-General of Forests or Conservator may, at the discretion of the Government of India, be allowed an additional pension of Rs. 1,000 a year, subject to the condition that the officer must not retire voluntarily before the completion of a total qualifying service of 28 years.

Subject to certain prescribed conditions, rupee pensions are now issued to pensioners residing in countries where the Indian rupee is not legal tender at the rate of exchange of 1*s.* 9*d.* the rupee.

2. A General Provident Fund has also been established on the following basis :—

(*a*) The contribution is compulsory up to 6¼ per cent on salaries, with voluntary contributions of not more than a further 6¼ per cent. Subscriptions on leave of any kind are optional ; other forms of life insurance will, if they fulfil certain conditions, be accepted in lieu of such contribution.

(*b*) Compound interest on such payments is annually credited by Government to each officer subscribing, the rate being at present 4 per cent per annum.

(*c*) The sum which will thus accumulate to the credit of an officer to be his absolute property, to be handed over to him unconditionally on quitting the service ; or, in the event of his death before retirement, to his legal representatives.

APPENDIX V.

GENERAL PHYSICAL REQUIREMENTS.

Note.—These Regulations are published for the convenience of candidates and in order to enable them to ascertain the probability of their coming up to the required physical standard. But it must be clearly understood that the Secretary of State reserves to himself an absolute discretion to reject as unfit any candidate whom he may consider, after hearing the opinion of his medical advisers, to be physically disqualified for the public

service; and that his discretion is in no respect limited by these Regulations.

1. A candidate must be in good mental and bodily health, and free from any physical defect likely to interfere with efficient performance of duty.

2. In the examination of candidates the Medical Board will apply the following table of correlation of age, height, and chest girth:—

Age.	Height without shoes.	Chest.	
		Girth when expanded.	Range of expansion.
	Inches.	Inches.	Inches.
19 to 20	62½ and under 65	35	2
	65 ,, 68	35	2
	68 ,, 70	35½	2
	70 ,, 72	36	2
	72 and upwards.	36½	2½
21 and upwards	62½ and under 65	35	2
	65 ,, 68	35½	2
	68 ,, 70	36	2
	70 ,, 72	36½	2½
	72 and upwards.	37	2½

3. *Measurement of Height.*—The candidate will be placed against the standard with his feet together, and the weight thrown on the heels, and not on the toes or outside of the feet. He will stand erect without rigidity, and with the heels, calves, buttocks, and shoulders touching the standard; the chin will be depressed to bring the vertex of the head level under the horizontal bar, and the height will be noted in parts of an inch to eighths. No fixed limit of height is imposed.

4. *Measuremnent of Chest.*—The candidate will be made to stand erect with his feet together and to raise his hand above his head. The tape will be carefully adjusted round the chest, the posterior upper edge touching the inferior angles of the shoulder blades, and its anterior lower edge the upper part of the nipples. The arms will then be lowered to hang loosely by the side, and

care will be taken that the shoulders are not thrown upwards or backwards so as to displace the tape.. The candidate will then be directed to empty his chest of air as much as possible. This is best done by continuous whistling with the lips as long as sound can be produced. The tape is carefully gathered in during the process, and when the minimum measurement is reached it is recorded. The candidate will then be directed to inflate his chest to its utmost capacity. This maximum measurement will likewise be noted. The girth with the chest fully expanded and the range of expansion between the minimum and the maximum will then be recorded.

5. The hearing must be good.

6. The speech without impediment.

7. The teeth in good order, *i.e.*, decayed or broken teeth must be properly stopped or crowned, and deficient teeth replaced by artificial teeth where necessary for effective mastication.

8. The chest must be well formed, the lungs and heart sound.

9. Rupture, hydrocele, varicocele, varicose veins in a severe degree, or other condition likely to cause inefficiency will disqualify a candidate, unless such condition is cured by operation.

10. The limbs, feet, and toes must be well formed and developed, with free and perfect motion of all the joints.

11. A candidate must have no congenital malformation or defect likely to interfere with efficiency.

12. A candidate must not be the subject of chronic skin disease.

13. Evidence of previous acute or chronic disease pointing to an impaired constitution will disqualify.

14. Candidates may, not more than two years before they are qualified to compete for an appointment, undergo a preliminary examination by the Medical Board, which meets at the India Office every Tuesday, under the following conditions :—

(*a*) Applications must be addressed to the Under-Secretary of State, India Office, Whitehall, London, accompanied by a fee of two guineas and a statement of the candidate's age.

(*b*) Candidates must pay their travelling expenses.

(*c*) Candidates considered to be unfit by the Medical Board at this preliminary examination are not bound to accept its opinion, but may, *at their own risk*, continue their studies, with the knowledge that they will have to submit themselves for a final medical examination by the Medical Board, prior to their appointment.

(*d*) On the other hand, it must be distinctly understood that the preliminary examination by the Medical Board is held solely for the candidate's information, and that, if after that examination he is reported to be apparently fit, he has not on that account any claim to be accepted as physically fit when he presents himself for the final medical examination, upon which alone his acceptance or rejection will depend. Candidates may be considered fit for the service at the preliminary examination, but may be found at the final examination to be unfit, either on account of some physical defect which did not exist or passed undetected at the preliminary examination, or for other reasons.

REGULATIONS AS TO THE STANDARD OF VISION FOR THE INDIAN FOREST SERVICE.

1. If myopia in one or both eyes exists, a candidate may be passed, provided the ametropia does not exceed 2·5 D, and if with correcting glasses, not exceeding 2·5 D, the acuteness of vision in one eye equals $\frac{6}{6}$ and in the other $\frac{6}{9}$, there being normal range of accommodation with the glasses.

2. Myopic astigmatism does not disqualify a candidate for service, provided the lens or the combined spherical and cylindrical lenses required to correct the error of refraction do not exceed—2·5 D ; the acuteness of vision in one eye, when corrected being equal to $\frac{6}{6}$, and in the other eye $\frac{6}{9}$, together with normal range of accommodation with the correcting glasses, there being no evidence of progressive disease in the choroid or retina.

3. A candidate having total hypermetropia not exceeding 4 D is not disqualified, provided the sight in one eye (when under the influence of atropine) equals $\frac{6}{6}$, and in the other eye equals $\frac{6}{9}$, with + 4 D or any lower power.

4. Hypermetropic astigmatism does not disqualify a candidate for the service, provided the lens or combined lenses required to cover the error of refraction do not exceed 4 D, and that the sight of one eye equals $\frac{6}{6}$ and of the other $\frac{6}{9}$, with or without such lens or lenses.

5. A candidate having a defect of vision arising from nebula of the cornea is disqualified if the sight of one eye be less than $\frac{6}{12}$. In such a case the better eye must be emmetropic. Defects of vision arising from pathological or other changes in the deeper structures of either eye, which are not referred to in the above rules, may exclude a candidate for admission into the service.

6. Squint, or any morbid condition, subject to the risk of aggravation or recurrence, in either eye, may cause the rejection of a candidate. The existence of imperfection of colour sense will be noted on the candidate's papers.

Ordered that a copy of the foregoing Regulations be forwarded, for information, to the Local Governments and Administrations noted in the margin, the Inspector-General of Forests and the Comptroller, India Treasuries. Also that the Regulations be published in the Supplement to the *Gazette of India*.

1. The Secretary to the Government of Madras, Revenue Department.
2. ,, Chief Secretary to the Government of Bombay, Revenue Department.
3. ,, Secretary to the Government of Bengal, Revenue Department.
4. ,, Chief Secretary to the Government of the United Provinces.
5. ,, ,, ,, ,, Punjab.
6. ,, Revenue Secretary to the Government of Burma.
7. ,, Financial Secretary to the Government of Eastern Bengal and Assam.
8. ,, Honourable the Chief Commissioner of the Central Provinces.
9. ,, Chief Commissioner of Coorg.
10. ,, ,, Ajmer.
11. ,, Honourable the Agent to the Governor-General and Chief Commissioner in Baluchistan.
12. ,, Honourable the Chief Commissioner and Agent to the Governor-General in the North-West Frontier Province.
13. ,, Superintendent of Port Blair.

E. D. MACLAGAN,
Secretary to the Government of India.

For Office use only.
No.
Ackd.

INDIAN FOREST SERVICE.

FORM TO BE FILLED UP BY CANDIDATES FOR APPOINTMENT AS PROBATIONER, 1912.

No person will be considered as a Candidate from whom the Secretary, Judicial and Public Department, India Office, Whitehall, London, S.W., shall not have received, on or before Monday, the 1st July 1912, *at latest, an application on this form.*

If Candidates who fill up and return the Application Form do not receive an acknowledgment of it within four complete days, they should communicate with the Secretary, Judicial and Public Department.

INDIA OFFICE.
August 1911.

1	Name in full.
2	Address. (*Any alteration to be notified to the Secretary, Judicial and Public Department, India Office, Whitehall, London, S.W.*)
3	Date and place of Birth. (*In the event of the Candidate's selection, he will be required to produce a Birth Certificate or other satisfactory evidence of age.*)
4	Profession or occupation, and nationality of Father.

5	The names of any near relatives who have been, or are now, in the service of the Indian Government, and the appointments at present, or immediately before retirement or decease, held by them.
6	All Institutions where educated, with dates, distinguishing whether or not the Candidate was in residence at such Institutions. *From* *to* *at* *From* *to* *at* *From* *to* *at* *From* *to* *at*
7	Whether trained at the public expense in any Training College in England and Wales.

8	The Candidate should insert here full information with regard to his qualifications, under paragraph 5 of the Regulations.
9	Whether married or single (*see* paragraph 4 of Regulations).
10	Names and addresses of three persons (of whom at least one should be connected with the Institution at which the Candidate has last studied) who will testify, if applied to, as to conduct and character during the last four years. (*References will not be accepted from persons who are related to or have no personal knowledge of the Candidate.*)
11	Whether the Candidate has previously applied, either in England or in India, for an appointment under the Government of India.

Signature of Candidate _____

Date _____ 1912.

THE CALCULATION OF THE YIELD BY NUMBER OF TREES UNDER THE SELECTION SYSTEM.

In many Indian working-plans the yield by number of trees under the selection system is calculated by the formula $I + \frac{1}{2}\frac{II}{p}$

where I = No. of 1st class (*i.e.* exploitable) trees enumerated.

II = No. of 2nd class trees enumerated.

p = period of years for which the fellings are prescribed.

This general formula has often been indiscriminately applied, whatever the relation between the period of the working-plan, the felling cycle and the transition period (*i.e.*, time taken for a tree of the lowest dimensions of class II or III to reach the lowest dimensions of class I or II). This has been a somewhat fruitful source of error in the calculation of the yield, for the above formula is applicable only in one particular case, namely, where the felling cycle period of the working-plan and transition period are all equal [see formula No. (4) below]. With different variations in these three factors complicated formulæ of considerable length may be evolved, and it is therefore advisable, in the interests of simplicity, to fix them in such a way as to avoid the more complicated formulæ, while at the same time obtaining the highest possible yield compatible with practicability in working.

The number of different formulæ applicable to different cases is considerable, but for our purpose it will be sufficient to take 8 variations. The ideal case is where fellings go over the whole area every year, the maximum possible yield being thereby obtained. Except for very small areas, however, this is impracticable, and a felling-cycle extending over a series of years has to be adopted, during which fellings go completely over the area. This results in an accumulation of mature trees which have reached maturity in each coupe after the fellings have passed over it ; this accumulation constitutes an excess of mature trees which has to be kept on the ground, and may be regarded as so much working capital. The reduction of this excess to the minimum possible, so far as is compatible with practical working and simplicity, should be one of the chief aims in fixing the period and the felling cycle.

Apart from this excess we have, in our irregular Indian forests generally, a certain further excess in the shape of mature (I class) trees standing on the ground at the commencement of the period ; these trees we may assume to be all removable except those retained for sylvicultural reasons.

In the 8 variations considered below, which comprise all those likely to be met with in ordinary practice as well as some of a more complicated nature, the general formulæ are evolved from concrete examples to make matters clearer, except formula (1) which is self-evident.

In the calculations below the following symbols are employed :

I = No. of I class trees enumerated.
II = No. of trees which were II class at time of enumeration.
III = " " " " III " " " "

(*Note.*—In the formulæ below it is assumed that the actual number of trees, as enumerated, will be reduced before the formula is applied, to allow for trees which will never become exploitable, or will not be removed during the period).

y = average annual yield for the period p.
p = period (*i.e.*, number of years) for which fellings are prescribed.
f = felling cycle.
n = number of felling cycles in period.
t = transition period.
^{t}II = time taken for smallest II class tree to reach I class size.
^{t}III = time taken for smallest III class tree to reach II class size ; and so on.

(*Note.*—For the sake of simplicity, the calculations refer to the *end* of the growing season in the case of the first three formulæ and to the *middle* of it in the case of the remainder.)

A.—FELLING—CYCLE ANNUAL.

(*i.e.*, whole area gone over each year : an ideal case.)

1. *Period equal to time taken for II to become I.*

(*i.e.*, $p = {}^{t}II$)

Then $y = \frac{I + II}{p}$ (1)

(*i.e.*, all I and all II, when the latter become I class, may be removed during the period.)

2. *Period less than time taken for II to become I.*

(*i.e.*, p $\angle$ ^{t}II)

Example:—Suppose ^{t}II = 30 years, and p = 20 years.

Then only $\frac{20}{30}$ of II will reach I class size during the period.

Hence $y = \frac{1}{20} + \frac{\frac{20}{30}\,II}{20}$

$$\text{or} \quad y = \frac{I + \frac{p}{{}^{t}II}\,II}{p} \qquad (2)$$

3. *Period greater than time taken for II to become I.*

(*i.e.*, p > ^{t}II).

Example:—Suppose p = 30 years.

^{t}II = 20 years.

^{t}III = 25 years (*i.e.*, time taken for III to become II).

After 20 years all II will have become I and will have been removed. From the 21st to the 30th year $\frac{1}{25}$ of III will on an average reach I class size annually, making a total of $\frac{10}{25}$ during the 10 years.

$$\text{Hence} \quad y = \frac{I}{30} + \frac{II}{30} + \frac{\frac{30-20}{25} \times III}{30}$$

$$\text{or} \quad y = \frac{I + II + \frac{p - {}^{t}II}{{}^{t}III} \times III}{p} \qquad (3)$$

B.—FELLING—CYCLE NOT ANNUAL.

(*i.e.*, two or more years taken to go round the area: the usual procedure in practice.)

1. *Felling cycle equal to period.*

(*i.e.* f = p)

(i) *Felling cycle equal to transition period.*

(*i.e.*, f = p = ^{t}II)

Example:—Suppose f = p = ^{t}II = 30.

Then the state of affairs will be :—

At end of year.		*Proportion of II class trees which will have reached I class size, and may be felled.*
1st	...	$\frac{1}{30}$
2nd	...	$\frac{2}{30}$
3rd	...	$\frac{3}{30}$
:	...	:
:	...	:
15th	...	$\frac{15}{30}$
:	...	:
:	...	:
29th	...	$\frac{29}{30}$
30th	...	$\frac{30}{30}$

The number actually removable during the period will therefore be $\frac{15}{30}$ II, and the number left on the ground as an unavoidable excess at the end of the period will be $\frac{15}{30}$ II.

$$\text{Hence } y = \frac{I + \frac{1}{2} II}{p} \qquad (4)$$

[This is the simplest case for general use in working-plans but the formula is often wrongly applied to other cases.]

(ii) *Felling cycle greater than transition period.*

(*i.e.*, $f = p > {}^{t}II$).

Example :—Suppose $f = p = 30$ years, ${}^{t}II = 20$ years, ${}^{t}III = 25$ years.

At end of year.		*Proportion of II class trees which will have reached I class size, and may be felled.*		*Proportion of III class trees which will have reached*	
				II Class size.	*I Class size.*
1st	...	$\frac{1}{20}$	$\frac{1}{2}$ of $\frac{20}{30}$ of all II actually available for felling during the period.	$\frac{1}{25}$	—
2nd	...	$\frac{2}{20}$		$\frac{2}{25}$	—
3rd	...	$\frac{3}{20}$		$\frac{3}{25}$	—
:	...	:		:	:
10th	...	$\frac{10}{20}$		:	:
:	...	:		:	:
15th	...	:		$\frac{15}{25}$	—
:	...	:		:	:
20th	...	$\frac{20}{20}$		$\frac{20}{25}$	—

21st	...	—	$\frac{21}{25}$	$\frac{1}{25}$	$\frac{10}{30}$ of $\frac{1}{2}$ of $\frac{10}{25}$ of III available for felling during period.
:	...	:	:	:	
25th	...	—	$\frac{25}{25}$	$\frac{5}{25}$	
:	...	:	:	:	
30th	...	—	—	$\frac{10}{25}$	

$\frac{10}{30}$ of all II available for felling during the period.

Hence $$y = \frac{I}{30} + \frac{\frac{1}{2} \times \frac{20}{30} \times II}{30} + \frac{\frac{10}{30} \times II}{30} + \frac{\frac{10}{30} \times \frac{1}{2} \times \frac{10}{25} \times III}{30}$$

or $$y = \frac{I + \left(\frac{1}{2} \frac{{}^{t}II}{p} + \frac{p - {}^{t}II}{p} \right) II + \left(\frac{p - {}^{t}II}{p} \times \frac{1}{2} \times \frac{p - {}^{t}II}{{}^{t}III} \right) III}{p}$$

This simplifies to $$y = \frac{I + \frac{2p - {}^{t}II}{2p} II + \frac{(p - {}^{t}II)}{2p\,{}^{t}III} \times III}{p} \qquad (5)$$

(iii) *Felling-cycle less than transition period.*
(*i.e.*, $f = p < {}^{t}II$).

Example :—Suppose $f = p = 16$ years and ${}^{t}II = 20$ years.

Then the following represents the state of affairs :—

At end of year.		*Proportion of II class trees which will have reached I class size and may be felled.*
1st	...	$\frac{1}{20}$
2nd	...	$\frac{2}{20}$
3rd	...	$\frac{3}{20}$
:	...	:
:	...	:
8th	...	$\frac{8}{20}$
:	...	:
:	...	:
15th	...	$\frac{15}{20}$
16th	...	$\frac{16}{20}$

Then $$y = \frac{I + \frac{1}{2} \times \frac{16}{20} \times II}{16}$$

or $$y = \frac{I + \frac{1}{2} \times \frac{p}{{}^{t}II} \times II}{p} \qquad (6)$$

2. *Felling-cycle less than, but not a submultiple of, period.*

One case will suffice here, namely, where *the period is equal to the time taken for II to become I.*

(*i.e.*, $f < p$, and $p = {}^{t}II$).

Example :—Suppose $f = 16$ years and $p = {}^{t}II = 20$ years.

Then the following represents the state of affairs :—

	Coupe No.		*End of year.*		*Proportion of II class trees which will have reached I class size and may be felled.*
First felling-cycle.	1	...	1st	...	$\frac{1}{20}$
	2	...	2nd	...	$\frac{2}{20}$
	3	...	3rd	...	$\frac{3}{20}$
	:	...	:	...	:
	:	...	:	...	:
	8	...	8th	...	$\frac{8}{20}$
	:	...	:	...	:
	:	...	:	...	:
	15	...	15th	...	$\frac{15}{20}$
	16	...	16th	...	$\frac{16}{20}$

	Coupe No.		*End of year.*		*Proportion of II class trees which will have reached I class size and may be felled.*
Commencement of second felling cycle.	1	...	17th	...	$\frac{17}{20} - \frac{1}{20}^{*} = \frac{16}{20}$
	2	...	18th	...	$\frac{18}{20} - \frac{2}{20}^{*} = \frac{16}{20}$
	3	...	19th	...	$\frac{19}{20} - \frac{3}{20}^{*} = \frac{16}{20}$
	4	...	20th	...	$\frac{20}{20} - \frac{4}{20}^{*} = \frac{16}{20}$

*Already removed in first felling-cycle.

Then $$y = \frac{I + \frac{1}{2} \times \frac{16}{20} \times II + \frac{4}{16}^{*} \times \frac{16}{20} \times II.}{20}$$

or $$y = \frac{I + \frac{1}{2} \times \frac{f}{p} \times II + \frac{p-f}{f} \times \frac{f}{p} \times II}{p}$$

which simplifies to $$y = \frac{I + \left(1 - \frac{f}{2p}\right) II}{p} \qquad (7)$$

3. *Felling-cycle a submultiple of the period.*

One case will suffice here, namely, where *the period is equal to the time taken for II to become I.*

(*i.e.*, $f=\frac{p}{n}$, and $p = {}^{t}II$, where n is an integer and = number of felling-cycles in the period.)

Example 1 :—Suppose f = 12 years, and $p = {}^{t}II = 24$ years ; hence $n = 2$, and the submultiple is $\frac{1}{2}$.

Then the following represents the state of affairs :—

	Coupe No.		*End of year.*		*Proportion of II class trees which will have reached I class size and may be felled.*
1st felling-cycle.	1	...	1st	...	$\frac{1}{24}$
	2	...	2nd	...	$\frac{2}{24}$
	:	...	:	...	:
	:	...	:	...	:
	6	...	6th	...	$\frac{6}{24}$
	:	...	:	...	:
	:	...	:	...	:
	12	...	12th	...	$\frac{12}{24}$
2nd felling-cycle.	1	...	13th	...	$\frac{13}{24} - \frac{1}{24}^{*} = \frac{12}{24}$
	2	...	14th	...	$\frac{14}{24} - \frac{2}{24}^{*} = \frac{12}{24}$
	:	...	:	...	:
	:	...	:	...	:
	6	...	18th	...	$\frac{18}{24} - \frac{6}{24}^{*} = \frac{12}{24}$
	:	...	:	...	:
	:	...	:	...	:
	12	...	24th	...	$\frac{24}{24} - \frac{12}{24}^{*} = \frac{12}{24}$

*Already removed in first felling-cycle.

$$\text{Hence } y = \frac{I + \frac{1}{2} \times \frac{12}{24} \times II + \frac{12}{24} II}{24}$$

$$\text{or } y = \frac{I + \left(\frac{1}{2} + \frac{f}{p} + \frac{f}{p}\right) II.}{p}$$

Example 2 :—Suppose f = 8 years, and $p = {}^{t}II = 24$ years ; hence $n = 3$, and the submultiple is $\frac{1}{3}$.

Then the following represents the state of affairs :—

	Coupe No.		*End of year.*		*Proportion of II class trees which will have reached I class size and may be felled.*
1st felling-cycle.	1	...	1st	...	$\frac{1}{24}$
	2	...	2nd	...	$\frac{2}{24}$
	:	...	:	...	:
	:	...	:	...	:
	4	...	4th	...	$\frac{4}{24}$
		...	:	...	:
	:	...	:	...	:
	8	...	8th	...	$\frac{8}{24}$
2nd felling-cycle.	1	...	9th	...	$\frac{9}{24} - \frac{1}{24}^{*} = \frac{8}{24}$
	2	...	10th	...	$\frac{10}{24} - \frac{2}{24}^{*} = \frac{8}{24}$
	:	...	:	...	:
	:	...	:	...	:
	4	...	12th	...	$\frac{12}{24} - \frac{4}{24}^{*} = \frac{8}{24}$
	:	...	:	...	:
	:	...	:	...	:
	8	...	16th	...	$\frac{16}{24} - \frac{8}{24}^{*} = \frac{8}{24}$
3rd felling-cycle.	1	...	17th	...	$\frac{17}{24} - \frac{1}{24}^{*} - \frac{8}{24}\dagger = \frac{8}{24}$
	2	...	18th	...	$\frac{18}{24} - \frac{2}{24}^{*} - \frac{8}{24}\dagger = \frac{8}{24}$
	:	...	:	...	:
	:	...	:	...	:
	4	...	20th	...	$\frac{20}{24} - \frac{4}{24}^{*} - \frac{8}{24}\dagger = \frac{8}{24}$
	:	...	:	...	:
	:	...	:	...	:
	8	...	24th	...	$\frac{24}{24} - \frac{8}{24}^{*} - \frac{8}{24}\dagger = \frac{8}{24}$

*Already removed in first felling-cycle.
†Already removed in 2nd felling-cycle.

$$\text{Hence } y = \frac{I + \frac{1}{2} \times \frac{8}{24} \times II + \frac{8}{24} II + \frac{8}{24} II}{24}$$

$$\text{or } y = \frac{I + \left(\frac{1}{2} \times \frac{f}{p} \times \frac{2f}{p}\right) II}{p} \text{ where the submultiple is } \frac{1}{3}$$

From these examples we may deduce the following general formula:—

$$y = \frac{I \times \left[\frac{1}{2} \times \frac{f}{p} + (n-1)\frac{f}{p}\right] II.}{p}$$

and since $\frac{p}{f} = n$, we obtain the formula

$$y = \frac{I + \left(1 - \frac{1}{2n}\right) II}{p} \qquad (8)$$

[*Note* 1.—This formula is only a modification of formula (7), for if the value $\frac{p}{f}$ be substituted for n we obtain the formula $y = \frac{I + (1 - \frac{f}{2p})\ II}{p}$

2.—If we apply formulæ (7) or (8) to the case of annual fellings over the whole area, where $f = 1$ and $n = p$, we find that $y = \frac{I + (1 - \frac{1}{2p})\ II}{p}$, whereas according to formula (1) above it should be $y = \frac{I + II}{p}$. The discrepancy is explained by the fact that, as noted above, formula (1) applies to the *end* and formulæ (7) and (8) to the *middle* of the growing season, so that the latter show half a season's increment less than the former.]

An important corollary to formula (8) is that where the period, p, is constant, the greater the number of felling cycles in the period, the higher will be the annual yield and the smaller the unavoidable excess on the ground; for neglecting trees which were I class at the time of enumeration and considering only II class trees which reach I class size during the period, it is evident that the higher the value of n the greater will be the value of the expression $1 - \frac{1}{2n}$ in the formula.

The objection may be raised that some of the above formulæ are of merely theoretical interest. This is true to a certain extent; some of them, however, cover cases which actually occur in

working plans, in which the yield has not been accurately calculated. A common error, as has already been mentioned, is to apply formula (4) to cases to which one of the more complicated formulæ is applicable: this is often done where there are two felling-cycles in the period—a common arrangement in the interests of sylviculture—in which case formula (8) and not formula (4) is applicable, provided the period is equal to the time taken for II to become I.

Simplification can generally be effected by making the period for which the yield is calculated equal to the transition period from class II to class I, this transition period being rounded off to suit the requirements of the case, for it is never so accurately determined as not to be alterable to some extent. This arrangement, however, is not always possible, particularly when two or more principal species are under consideration.

So long as the determination of the yield by number of trees bears the importance which it does at present in Indian working-plans for selection-worked forests, its correct calculation is a matter of importance, and as the relations between working-plan period, felling-cycle and transition period from class to class do not appear to be clearly brought out in text-books, it is hoped that the above details may be of some use to working-plans officers, if only as a means of checking their calculations. This limitation of the yield, often to the detriment of sylvicultural requirements, is in the writer's opinion apt to be over-done, based as it frequently is on insufficient *data*: that, however, is another matter, and does not effect the question that accuracy in calculations, if they are to be made, is desirable.

R. S. TROUP.

DEPARTURE ON LEAVE OF MR. J. D. MAITLAND-KIRWAN, ONE OF THE INSTRUCTORS AT THE IMPERIAL FOREST COLLEGE, DEHRA DUN.

On the evening of the 27th ultimo Mr. J. D. Maitland-Kirwan, one of the Instructors of the Imperial Forest College, was invited by the students to a garden party, which was held on the eve of

his departure in order to give them an opportunity of expressing their deep gratitude to him, for his ready condescension in always doing his best to help them, both in and out of class hours, whether at the head-quarter or out in the camp. The President as well as all the other Research Officers, Instructors and Assistant Instructors and Mr. Clutterbuck, Conservator of Forests, were present.

To commemorate the occasion a group photo was first taken of all the officers present with students of the College; several farewell addresses were then read out by the students giving full vent to their feelings of gratitude, admiration and respect for Mr. Kirwan on his departure on furlough, and wishing him a safe journey home, every happiness in the company of his friends and relations there, and speedy return to his duty with renewed health and vigour.

The President of the Research Institute in his brief but eloquent speech echoed the feelings of the students towards Mr. Kirwan and expressed his appreciation of Mr. Kirwan's work, and hoped that it would be possible to again secure his services for a further period for the benefit of the students of the Forest College, on his return from leave.

Mr. Kirwan then thanked the President for his high appreciation of his services and also the students for their address and for their kind wishes. Light refreshment was then partaken of and a band enlivened the proceedings, at the end of which Mr. Kirwan bade good-bye to all.

A STUDENT.

PUNJAB FOREST ADMINISTRATION REPORT FOR 1910-11.

The area of State forests in the Punjab is steadily diminishing and now stands at 8,734 sq. miles. During 1910-11 about 18 sq. miles of reserved and protected forest were given up to the Revenue Department for colonisation. It explained in the report that the areas now to be colonised were never intended for permanent retention as forest, and were only reserved in order to

be eventually abandoned for cultivation. Further surrenders of forest area are under contemplation, but the present extent of the forest lands seems very small in comparison with the area of the province, and it may be hoped that future disforestments will be to some extent counterbalanced by the starting of new irrigated plantations, like Changa Manga, in suitable localities. There is some indication in the report that this is likely to be done.

We read that "the situation as regards working-plans generally is fairly satisfactory," but Form 55 shows that plans have still to be taken in hand for nearly half the total area of reserved and protected forests. No plans are likely to be required for areas which will probably be disforested in the near future, but it is impossible to obtain from the report a clear idea of the still untouched area for which plans are really necessary. A number of the existing plans are said to require revision as it has been found necessary to substitute the group for the selection system in the treatment of Deodar. This may be so but we should like to see proof of this necessity. On the whole it seems that a good deal of urgent work still remains to be done, and it is to be hoped that circumstances will permit of this being pushed on with as little delay as possible.

Under "Communications," the most important undertaking of the year, was the construction of 3 miles of wire ropeway in the Rawalpindi Division at a cost of Rs. 51,207. The system adopted was that which will be familiar to many of our readers from the small show installation in the Forestry Court of the recent Exhibition at Allahabad. In Rawalpindi it is reported to have given "an extraordinary amount of trouble, largely owing to defects in its design," and we are told that the estimated cost was exceeded by twenty per cent, that the plant was not in working order until six months after the expected date, that it will not carry its designed load, and that the working expenses are three times higher than was estimated by the contracting firm. Clearly this new venture has made an inauspicious start. Even the small show installation at Allahabad is understood to have

given a lot of trouble to all who had to do with it, and if the defects are due in any way to Messrs. Ropeways, Ltd., about which we can express no opinion without further evidence, they will have to pay more attention to its requirements if they wish to do much business with the Forest Department in India. Meanwhile the working of the Rawalpindi concern will be watched with interest and future reports from the Punjab will doubtless show to what extent it is paying its way or the reverse. The unfortunate start made by this new departure is the more to be regretted since a considerable number of the ordinary road and building schemes of the year appear to have been postponed or abandoned in its favour.

As in most parts of India, breaches of forest rules continue to rise steadily, the increase during the year under report amounting to 15 per cent as compared with the average of the three previous years. Fire-protection was generally successful in all Divisions except Rawalpindi, where failures amounted to 10·6 per cent. Incendiarism appears to have become a habit in this Division, as we are told that "the desire of the people to obtain fresh grass has little to do with their action in firing the forests." Is it a new and attractive form of recreation, or merely a symptom of general "cussedness"? All we are told is that the Local Government is being asked to take special measures to cope with this fire-raising epidemic, and we take it that punitive closure of the afflicted forests will be part of the plan of campaign. It is said that out of 236 fires, 52 were malicious and 64 were caused by travellers passing through the forests, but Form No. 57 shows that the culprits were actually detected in only 28 fire cases during the year. Surely the origin of most fires in which the offenders escape detection must remain to some extent a matter of conjecture!

Grazing appears to present a difficult problem, and some useful experiments are in progress to test the incidence of grazing permissible in hill forests. If the figures in the forms appended to the report are reliable, the incidence of grazing in the protected forests was one animal for every 1·3 acres, and as the

pastured animals are mostly browsers, it is difficult to resist the conclusion that the existence of many of these forests must be threatened. More than four-fifths of the entire forest area of the Province was open to animals of various kinds and we would commend to the notice of the Punjab authorities the conclusion recently arrived at by the Local Government of another Province :—

> " *Very cheap fodder grass as a substitute for very cheap grazing should prove of great advantage to the cattle of the country.*"

Parasitic fungi are giving some cause for anxiety. *Trametes pini* appears to have taken firm hold of the blue pine in parts of at least three Divisions, and we believe that the same pest has recently been shown to attack the Deodar. *Fomes becidies* is destroying the shisham in Changa Manga, and another fungus, as yet unidentified, is found on the mulberry. Fortunately insect pests appear to be of comparatively slight importance. Heavy snowfall is said to have been responsible for much damage last winter, particularly in unthinned coniferous crops.

Attempts at artificial regeneration have almost entirely ceased for the present, as it has been found impossible to carry on such works except at a heavy loss. This should not, however, be regarded as the last word to be said on the subject ; it merely indicates the necessity for further experiment and research with a view to the discovery of cheaper and more efficien methods. The most important cultural operations of the year have been thinnings in coniferous forests. The Conservator is of opinion that it is urgently necessary to extend these operations, and it is satisfactory to read that subordinates trained at the Provincial Forest School have shown themselves capable of marking thinnings intelligently. A number of experiments, mostly of purely local interest, are now in progress. It is interesting to find that by dipping the ends of spruce and silver fir sleepers in hot coal-tar, the loss in floating has been reduced to two per cent, the average loss of untreated sleepers being forty per cent. An important series of experiments has been undertaken with a view to ascertaining the best methods of tapping *Pinus longifolia* for resin.

The deductions drawn from these experiments are likely to be applicable in other Provinces besides the Punjab.

There has been an increase in the area worked over as well as in the outturn of the forests under practically all heads. An important departure has been the starting of a departmental resin factory near Lahore. The process of steam-distillation employed appears to be worth a trial, though it is possible that superheated steam might give better results on a large scale, and when the Lahore factory has been running for some time, a comparison of its outturn and financial results with those of the United Provinces factory at Bhowali should be of interest and value. We are glad to note that the factory at Lahore has been started with the express purpose of encouraging private enterprise, to which the whole concern will perhaps be made over as soon as it has served to show that the industry can be run at a profit. The departmental share in the business will then be limited to selling to a private company the right to collect crude resin, and Government will cease to figure as a manufacturing agency. We should not be surprised if it is found that there are considerable difficulties in resin collection by a private company.

The actual gross revenue of the year shows an increase of nearly three lacs of rupees as compared with that of the previous year, and amounts to about Rs. 160 per square mile of forest area. This looks small in comparison with over Rs. 500 in the United Provinces, and about Rs. 240 in Bombay, but a considerable portion of the Punjab area is either desert or inaccessible rock and snow, so that the comparison is hardly a fair one. The surplus on the year's working was 48·5 per cent of the gross revenue and amounted to just over seven lakhs of rupees in which is a substantial improvement on the result of the previous year. The Conservator admits that the year 1910-11 was " abnormally profitable " but holds out hopes that the progress will be to some extent maintained, and devotes considerable space in his report to showing that there has been a steady improvement in the finances of the circle instead of deterioration as has been supposed.

The report indicates progress and enterprise in varied fields of forest activity. There are difficulties to be surmounted, but they are apparently being faced in earnest, and in some cases the solution seems to be in sight. Fruit-culture and olive-growing should, we think, hardly have been added to the tasks of a department which has more than enough legitimate work of its own to keep its staff employed at full pressure. The Conservator is of opinion that a "satisfactory report has been presented of results obtained and of foundations laid for future prosperity." We agree with him, but should have held this opinion even more strongly had he left us to form it for ourselves.

PROGRESS REPORT ON FOREST ADMINISTRATION IN THE REWAH STATE FOR THE FINANCIAL YEAR 1910-11.

A change in the *personnel* of the Forest Department of the Rewah State is to be recorded during the year, the post of the Superintendent of Forests having been taken over by Mr. Ganga Prasad Khatri.

The area of reserved forests in the State was increased during the year by 29 square miles, and stood at 1,306 square miles on the 31st March 1911. No settlement of reserved forests is considered necessary, since all forests, as a rule, belong to the State, and are held to be subject to no legal rights of user except under special gifts or *sanads* of the *ilaqadars*.

So far as can be judged from the report, fellings are not carried out under entirely satisfactory conditions. A rough working-plan, drawn up in 1884, and recently revised, applies to the Mukundpur forests (barely 2½ square miles, according to the area statement published), where apparently sylvicultural principles are only partly adhered to: elsewhere correct principles of forest management are set at naught, the surrounding population extracting their *nistar* from the forests at their will. We would commend the attention of the Durbar to this unsatisfactory state of affairs, for even if the main object of management is the supply

of free timber and other produce to the local population, there are correct and incorrect methods of effecting this object, and in the interests of the future maintenance of the forests the better policy is to adopt the former.

Financially speaking, the propagation of lac is by far the most important item in the management of the Rewah forests, the gross revenue derived from this source being Rs. 2,53,762 (of which all but Rs. 273 was obtained from departmental collections) out of a total gross revenue of Rs. 3,39,965. Attempts to introduce improved rules for the working of lac, instituted in the previous year, were not successful owing to the opposition of the subordinate staff ; it is hoped that this reason will not be considered sufficient to deter the Superintendent from continuing in his efforts to introduce more scientific methods of working. It would appear that improvements in the methods of manufacturing charcoal are also desirable, the average outturn being only 13 per cent of the reported weight of wood used, which is only about half what it should be.

With regard to sales of lac, there appear to be certain omissions or discrepancies in the Superintendent's report. In para. 56 he states that local sales of stick-lac fetched Rs. 11-12-0 per maund as against an average of Rs. 7-6-0 yielded by contract sales to Messrs. J. Thomas & Co., during previous years ; it is not stated, however, if the quality of the lac was identical in each case. Again in para. 58 he mentions that stick-lac converted into shellac fetched Rs. 12-2-0 per maund ; this leaves Re. 0-6-0 per maund as the cost of manufacture of shellac. In para. 50, however, it is stated that the cost of manufacture of shellac per maund is Rs. 7-4-10, which does not seem to tally with the previous statement.

Various other important minor products are yielded by the forest of the tate. *Mohwa* flowers and fruits, worth about a couple of lacs of rupees, are given free to the people. Catechu boiling yielded a revenue of Rs. 4,060, corundum Rs. 4,139, bamboos Rs. 19,863, and miscellaneous products such as *harra*, honey, wax, horns, gum, etc., Rs. 28,613.

The gross revenue and expenditure of the year amounted to Rs. 3,39,965 and Rs. 2,19,710 respectively, leaving a surplus of Rs. 1,20,255. This, however, represents but a fraction of the real value of the forests, for the quantity of produce given away free is considerable.

The report, though interesting, is marred by what is in our opinion an uncalled-for vein of criticism of the work of his predecessor by the new Superintendent of Forests. The Rewah State forests have for some time been under the management of an officer of ability and experience, deputed from the Central Provinces; to him belongs the credit of having organised the forests and placed them on as satisfactory a footing as could be expected considering the adverse conditions under which he worked. Such remarks, therefore, as the following, are, to say the least of it, ungenerous :—

"The office work and accounts of the Department were in a deplorable state when the writer took charge of the Department. Much improvement has been made, but a satisfactory stage has not as yet been attained, and it is hoped it will take at least six months to attain it."

For our part we hope that in raising the office work from its former "deplorable state" the Superintendent will also find time to prevail on the Durbar to effect some improvement in the conditions under which the forests are worked.

REVIEWS.

FORESTRY FOR WOODMEN.*

BY C. O. HANSON.

As the title indicates, this book has been written with the primary object of providing a simple and practical hand-book for the use of foresters and woodmen. There are few persons more competent to produce such a work than the writer, who has had

* Forestry for Woodmen, C. O. Hanson, Oxford, Clarendon Press, 1911, pp. 222, plates 12, figs. 15.

several years' experience in the instruction of woodmen at the Crown School of Forestry, Royal Forest of Dean. That he has made good use of the advantages possessed by him in this respect is evident on a perusal of the book, which contains a great deal of original matter, based on the author's practical experience, and should prove of great value to the forester and woodman.

Commencing with a brief description of the life-history of a typical tree, including its nutrition, growth, wood structure and reproductive organs, the writer proceeds to deal with the external factors influencing tree growth, and the considerations which determine the choice of species under different conditions. Perhaps the best and most original chapters are those dealing with practical sylvicultural matters, particularly the manner of forming and tending mixed woods of different combinations of species, nursery management, sowing and planting, and the subsequent tending of woodland crops. All these operations are dealt with in a thoroughly practical manner, and contain many useful hints based on the writer's personal experience.

Under the head of Forest Protection is given a brief description of the more destructive animals, birds, insects, weeds and fungi, with measures for combating the damage caused by them; damage by drought, storms and fire are also briefly dealt with. A chapter is devoted to fencing and draining, a number of good practical hints being given; a few diagrams illustrating the text would have added to its value.

Forest mensuration and working-plans are necessarily treated in the simplest and briefest manner possible, the former giving only a few simple rules for the measurement of trees, timber and fuel, and the latter containing a few essential points regarding the formation of working circles and felling series and the general arrangement of headings in a typical working-plan.

The book is written in a clear simple style, and contains some good photographic plates illustrating the sylvicultural subjects dealt with. It will be found of great assistance to the forester and woodman, and we can confidently recommend it to all who are interested in practical forestry in Britain.

THE ELEMENTS OF BRITISH FORESTRY.*

BY JOHN NISBET.

This book may be regarded as an abridgment of the author's larger work "The Forester," and has been written by way of a contribution towards the literature of technical education as outlined in the "Afforestation Policy" of the Development Commission, for the use of Forest apprentices as well as of students of Forestry. The aim of the author is a somewhat ambitious one, namely, to compress into the smallest possible space the four main branches of Forestry, namely, (1) Sylviculture, (2) Management, (3) Protection, and (4) Utilization, and to endeavour to produce a handy volume of small size which will be useful to students and Forest apprentices. As such the book should be a useful one, since the author, with a strict eye to brevity, has dispensed with all superfluous detail and set down in concise form the main essentials of the subjects he deals with.

The work is divided into four parts. Part I deals with Sylviculture, and comprises an outline of the history of British Forestry, a description of the chief trees and woodland crops of Britain with their sylvicultural characteristics, a consideration of the factors (climate, soil, etc.,) which have an influence on the growth of trees and woods, and a description of the methods employed in forming, tending and regenerating woods, both naturally and artificially. This part is on the whole clear and concise, but if anything it suffers from undue brevity, particularly in dealing with the principal sylvicultural systems. These systems, at all events those which deal with the natural regeneration of woods, are not as clearly understood in Britain as they might be, and it would have been useful to have given a somewhat more detailed account of the main points connected with their application.

Part II comprises Forest Mensuration, Working-plans, and Valuation. These subjects are dealt with in the simplest possible

* *The Elements of British Forestry*, a hand-book for Forest apprentices and students of Forestry, by John Nisbet. Professor of Forestry at the West of Scotland Agricultural College, pp. xii + 345, with 92 illustrations, William Blackwood and Sons, Edinburgh and London, 1911. Price 5*s.* 6*d.* net.

manner, elaborate formulæ being dispensed with. The three height-measuring instruments described are based on the plumb-line principle, and are therefore liable to give inaccurate results in windy weather : it would have been of advantage to describe at least one of the hypsometers or clinometers based on the weighted wheel principle, which are not subject to this defect, and to explain the use of height-measurement tables.

Part III, the Protection of Woodlands, deals with protection against human acts, animals, birds, insects, weeds, epiphytes, fungoid diseases, and inorganic dangers. This part is well written and contains a large amount of useful matter put together in a clear manner. Part IV, the Utilization of woodland produce, deals with the structure, technical properties, and uses of timber, the harvesting and disposal of woodland produce, the transport of timber, its seasoning and preservation, and ends with an account of some of the chief woodland industries, such as estate saw-mills, manufacture of wood-pulp, charcoal-making, resin-tapping, etc. The large subject of Forest Utilization is here necessarily dealt with in the briefest possible manner, only 65 pages being devoted to it ; the writer has, however, got as much material into this small compass as could reasonably be expected.

The value of " The Elements of Brit Forestry " lies in the purpose for which it is intended. The thor obviously never meant it as an advanced text-book dealing with all the details of forestry in its various branches, but as a handy book containing the main essentials of the elements of forestry, as applied to British conditions only. As such the book should be of great use to forest apprentices and students.

BAMBOOS FOR BRIDGES.

India is one of the homes of the bamboo, but it is not very much used for bridge building. In Java, however, it is found to serve that purpose excellently. In fact, the Public Works Engineers there have just completed a bamboo bridge more than a hundred feet long with a central span of sixty feet. The road

bed is composed of bamboo matting, covered with a layer of earth. In profile the bridge is said to resemble a steel structure, but all the members are bamboo rods. The Engineers are of opinion that this structure will stand for ten or fifteen years.—(*Capital.*)

DESTRUCTION OF CROPS BY HAIL.

Agricultural India will find the following information, for which we are indebted to the Journal of the Royal Society of Arts, equally interesting and useful :—

The damage to the crops in France from hail is estimated at 150 millions of francs (six millions sterling) every year. Many remedies have been tried, with more or less degree of success, in order to mitigate the evil, not only in that country, but also in Italy and Austria. The principal means adopted for the purpose during the last ten years has been the discharge of explosives during storms in the immediate vicinity of the crops threatened. In many parts of France, and more particularly in the vine-growing departments, associations of the landowners and cultivators have been formed for the mutual protection of their vineyards. In the Beaujolais district last year, no fewer than twenty-three of these societies were in existence; they are provided with 387 cannons or mortars. In another part of the same district, but separated by a considerable extent of unprotected country, there are six other societies with 137 stations for the discharge of rockets. These two groups form the 'Union des Associations Grêlifuges du Beaujolais,' and carry out their operations during storms on a preconcerted plan. In this district there are also several independent associations for *tirs contre la grêle*. The results obtained by these means of defence have, on the whole, been satisfactory in France, where public opinion is more unanimous as to its efficacy than is the case in Italy. The immediate effects of the discharge of explosives, either from cannon, mortar, or by means of a firework (*fusée*), is said to be to abate the thunder and lightning, to stop the wind, and to melt the hailstones before they can reach the ground or injure the plants.—(*The Leader.*)

MATCHES FROM GRASS AND STRAW.

A London paper tells of a process, said to be in the experimental stage, for manufacturing a wood substitute from dried grass or straw, which is primarily intended for use in the manufacture of matches. At the conclusion of the process, which is described as including crushing and stripping the straw and compressing a flat layer between sheets of paper and subsequently moulding the splints, the latter are cut to length and dipped in the match composition. When the scarcity of wood renders desirable the use of a substitute in match making in this country, a fruitful field will be opened to inventors.—(*Scientific American.*)

A TREE FELLING MACHINE.

Consul General Thackara has reported from Berlin another tree felling machine, in part as follows :—

"A machine for felling trees has been invented by Hugo Gantke of Berlin. The principle of the invention is that by pulling an ordinary steel wire rapidly back and forward around the tree to be felled, sufficient heat is developed by the friction to burn a smooth groove through the stem of the tree. The machine has been patented in Germany, Great Britain, Austria, and a number of other countries, and a patent has been applied for in the United States.

"The inventor illustrates his invention by means of an ordinary steel wire about a yard in length, which is provided with a single handgrip at each end, which he pulls rapidly back and forth around a chair or table leg, the wire thus burning a groove into the wood.

"A small wire is used on trees, to the end of it being attached cables run by an engine or motor.

"In cutting down trees the cable is chosen long enough to make it possible to place the machine out of reach of the falling tree. The machine may also be used in cutting logs or timber already felled, in which case a shorter cable may be used. The power required for European varieties of wood ranges from 1·5

to 7 horse-power, depending upon the hardness and dimensions of the timber. A 4-horse-power machine is said to cut down a pine 2 feet in diameter in about 5 minutes. The machine requires less than one-half of the time required for sawing down a tree by hand and about two-thirds of the time required for sawing logs or timbers that are lying on the ground. In the case of larger stems the machine requires only about one-fourth the time for sawing by hand.

"The wires are cheap and the whole machine with motor costs $ 650."—(*Forestry Quarterly*).

COMPLIMENTARY BANQUET TO SIR WILLIAM SCHLICH, K.C.I.E., F.R.S., ON HIS RETIREMENT.

On the 1st of August 1911, Sir William Schlich retired from the Indian Forest Service after over 45 years' active service in India and England. The occasion was marked by a complimentary banquet held on the 26th October last at the Trocadero Restaurant in London at which Mr. F. Beadon-Bryant, Inspector-General of Forests to the Government of India, presided. The attendance was limited to past and present members of the Indian Forest Service, of whom the following were able to be present :—

Messrs. F. Beadon-Bryant, F. J. Branthwaite, D. Bourke, A. Brasier, A. F. Broun, A. M. Caccia, F. Canning, M. Clifford, E. A. Courthope, E. Cubitt, J. Dodson, C. Doveton, C. Greathead, C. Hanson, A. Hobart-Hampden, A. B. Jackson, H. Jackson, C. A. Lillingston, W. F. Lloyd, W. H. Lovegrove, E. Marsden, E. McA. Moir, J. W. Oliver, L. S. Osmaston, R. S. Pearson, W. S. Powell, H. K. Robinson, J. J. Rorie, A. Smythies, and A. E. Wild.

Sir William Schlich is so well known to all our readers that it is perhaps unnecessary for us to add anything to the remarks made by Mr. F. Beadon-Bryant in proposing the health of the honoured guest of the evening. The whole proceedings were marked by the utmost cordiality and "*camaraderie*," and the thanks of all present were due to Mr. W. H. Lovegrove for the

trouble he had taken in making all the necessary arrangements. We reproduce below the speeches made by Mr. Bryant and Sir William Schlich, since although they have been published in the *Pioneer* many of our readers may not have seen them.

Mr. Bryant addressed the company in the following well chosen words:—

"GENTLEMEN,—We are assembled here this evening to do honour to our distinguished guest Sir William Schlich. As the senior Forest Officer still on the active list the honour of proposing his health falls to me, an honour of which I am proud.

We are, I think, a gathering which is fairly representative of the Imperial Forest Service of India, we are all members of that service and I am glad to see that no less than 30 of us are present, including representatives of all ranks from the junior officer up to the veteran, who after long and honourable careers are now resting upon their laurels. I had hoped that the probationers now under training at Oxford might also have been present as I am sure they would have wished to be, but unfortunately they have been unable to come as their examinations at Oxford are now being held.

I have received letters from several officers expressing their regret that they have not been able to attend. I will read you Colonel Pearson's letter:

'MY DEAR BRYANT,—Will you kindly tell my brother Foresters, both young and old, how very sorry I am not to be at the dinner they are giving to Sir William Schlich—and to Schlich himself express my most hearty and affectionate congratulations on the splendid services he has rendered to the cause of Forestry both in India and at home in Great Britain.

'With very kind regards to yourself,

Believe me always,
Yours very sincerely,
GEO. F. PEARSON.

Mr. Bagshawe also writes saying how very sorry he is he cannot be present and how fully he appreciates Sir William's many labours in the past and wishes them full success even beyon his hopes in the future Other officers expressing their regret that they have not been able to come to this dinner are—Colonel Bailey, Messrs. Popert, Drysdale, Hart, E. G. Oliver, McCarthy.

We are, I think, all of us acquainted generally with Sir William's career and I will only just touch on the main points thereof and on those which, as officers of the Imperial Forest Service, interest us most.

He was appointed to the Indian Forest Service, as early as 21st December 1866 : he served first in Burma, where he remained three years. He then went to Sind, where he also served for three years ; he was Conservator of Forests in Bengal from December 1872 to January 1880, and again he served as Conservator in the Punjab from January 1880 to October 1881. He was then appointed Inspector-General of Forests which post he held until November 1889. He was, however, deputed in 1885 as Professor of Forestry at Coopers Hill and he held this post till the 30th September 1905, a period of over 20 years.

When the forest students were removed to Oxford, Sir William accompanied them and continued to be in charge of them as Professor of Forestry, appointed by the Government until quite lately, when he was appointed Professor of Forestry by the Oxford University. This very brief reference to Sir William's remarkable career is enough to bring home to us the very great value of the services which he has rendered to the cause of Forestry. Apart from the important work which he did whilst in India, the chief result of these services is the high standard of efficiency and ability of the Imperial Forest Service in India to-day.

During the period that he has been in charge of the education of our young Forest Officers 308 men have successfully passed through his hands, *viz.* :—

219 Officers sent out to the Imperial Forest Service of India
7 Officers trained for Native States of India.
22 Officers trained for the Colonies.

24 Other students.

36 Probationers now under training.

Looking at the Imperial Forest Service of to-day we find it consists of 217 officers, of whom no less than 183 or 84 per cent have been trained by Sir William. I think that anyone who has worked in close touch with our Forest Officers in India will readily be able to bear witness to the high standard of efficiency and character of the men composing the Imperial Forest Service, and to the admirable manner in which the majority of them carry out the work which is given them to do, and which has too often to be done under very adverse and difficult conditions, more so perhaps than is the case in any other service in India. For this high standard of character and efficiency we have to thank Sir William more than any other man now alive, and accordingly in the name of the Imperial Forest Service of India, I beg to tender him our hearty gratitude for the prolonged, invaluable and successful efforts that he has made with the object of improving the personnel and efficiency of that service.

Besides his life-long work connected with India, Sir William has done great work in the encouragement of Forestry throughout the world. Wherever Forest problems are to the fore, we may find his works quoted, and his advice sought. His valuable Manuals on Forestry are, we know, of the greatest value to the Indian forester and are standard works for the increasing number of Governments, States and individuals who happily are interested in Forestry throughout the world. In England there has lately been an important movement for the development of Forestry in Great Britain and Ireland which may lead to great results in the future. Sir William has always taken a great interest in this movement and was perhaps its originator inasmuch as in 1886 he published his pamphlet entitled "Afforestation in Great Britain and Ireland," which drew public attention to the matter. He was a member of the Forest Committee which sat on this subject in 1902 and has published many articles and letters on the matter.

Returning now to India, the period of more than 40 years during which Sir William has been connected with that country

has naturally seen very great changes and developments. When he joined the service the work of the Forest Department was in its infancy, but a great step had already been made in advance by the appointment in 1864 of Sir Dietrich Brandis as first Inspector-General of Forests. This splendid officer at once began to develop and form a Forest administration on lines which, many of them, remain unchanged to this day, and the history of the formation of the Forest administration and of the gradual development of the Forest resources of the Indian Empire, though not unmarked by many a struggle and set-back from the authorities of the day, has on the whole been one of constant improvement and progress.

Any attempt to trace this history in any detail would lead me too far astray, and I will merely remind you that during this period the Government of India have accepted the policy that the maintenance of a due proportion of forests is essential for the well-being of the country, not only for the produce which they yield,but also for the indirect influences which they exert, such as the maintenance of an equable flow of water in springs and rivers.

They have provided, by means of the various Forest Acts, the necessary machinery for the selection, settlement and demarcation of forests, which it is considered should be set aside and managed as permanent forest estates ; and in accordance with this machinery a very large area of reserved forests has been formed.

To manage these estates on proper principles, an establishment of all ranks has been organised, and as the area of forests under the control of the Forest Department has increased, many reorganisations have taken place, both of the Imperial and Subordinate services, leading always to an increased personnel, and aiming at increased efficiency. The forest estates as they come under the undisputed control of the State have in great measure been brought under the provisions of working-plans, in the preparation of which great improvement is noticeable of late years.

The Forest School at Dehra Dun, started in 1878, has ever since then done the most valuable work in educating the members

of the subordinate and provincial services. In 1906 a notable step in advance was made by the formation of the Forest Research Institute at Dehra, where a staff of experts is now available for the scientific investigation of all problems connected with Forestry. Arrangements have been made for the better training of the subordinate service and an entirely separate course of training for the Provincial Forest Service will, it is hoped, be shortly brought into force.

We have also seen the lately sanctioned scale of pay for the Imperial as well as the Provincial Forest Service and the creation of two new posts of Chief Conservator of Forests, one in Burma one in the Central Provinces.

The arrangements for educating our young Forest Officers for the Imperial Service have undergone several changes. At first the young men were sent to Germany and France, and I venture to think that many good men were obtained in this manner, but in 1885 it was decided that the arrangement under which our young men were sent to the Forest School at Nancy were capable of improvement and it was arranged to send them to the Coopers Hill Engineering College.

Sir William was placed in charge of these arrangements and became Professor of Forestry at Coopers Hill, a post which he continued to hold for more than 20 years.

In 1905 on the abolition of Coopers Hill the forest students were sent to Oxford ; Sir William accompanied them and was appointed by the Government to be Professor of Forestry at the Oxford University ; he held this post until the 1st August, 1911, when the Government appointment which he held came to an end.

As you know the arrangements for training our young men have again been just changed ; what the results of the new arrangements will be is as yet uncertain and there are some features in the scheme which are not accepted as satisfactory by most Forest Officers. The changes made have however for their object the improvement of the education of our young recruits, and must be given a fair trial before any proposals for changing them are likely to be considered.

All these measures to which I have so briefly referred have naturally entailed heavy expenditure on the Government of India, but it has been amply repaid by a more than corresponding increase in revenue which has always responded in the past to an increased expenditure.

From this necessarily very incomplete reference to the history of Forestry during the past 40 years we see that there has been constant development and progress. During all this time we have had an Inspector-General of Forests at the head-quarters of Government of India, and it is a fact beyond dispute that much of the progress made has been due to the Inspector-General of the day. He is in the best position to initiate reforms and to place them before the Government of India in the proper way. You will, most of you, have heard that a proposal is now being put forward to abolish the post of Inspector-General of Forests. This proposal which has been simmering for some two years now has grown out of the proposals of the Decentralization Commission, owing to which many of the restrictions hitherto placed on Local Governments are being relaxed and much larger powers being given to them.

Coming after the long list of steps tending to, or at any rate aiming at, the improvement of Forestry in India to which I have just referred, it will I think be held by the majority of those interested, that this proposal, if carried out, will be a most retrograde and unwise step by which the future scientific progress of the Department will be endangered and its status lowered.

At present in India the financial position is no doubt unfavourable, and I believe the proposal is being pressed simply in order to save the few thousand rupees of the Inspector-General's pay. Unwise economy, gentlemen, to say the least of it, and a step which if carried out may result in the loss of many lakhs of rupees from the absence of expert advice at head-quarters, the adoption of unsuitable working-plans or the granting of unsuitable concessions.

If the Government of India desire more revenue from their forests they must spend more, not less, upon them ; establishments

are notably everywhere deficient and officers are very much hampered on this account. There is room for very great future development, but the abolition of the post of Inspector-General of Forests will retard and not encourage this development. Let me read to you what Colonel Pearson, our senior living Forest Officer, thinks of this proposal. He says :—

" I only heard a few days ago of the contemplated abolition of the Inspector-General, it is a most disastrous and retrograde measure for the Department. Decentralisation is all very well for the Civil Service and for the P. W. D. which must be run on practically the same lines all over India, but the forests, as old Bagneris says in his manual, are managed on principles based on observations which differ widely in different parts of the Indian continent. Extreme decentralisation then for the forests must inevitably end in reducing their management to a kind of little Peddlington arrangement which must lead not only to circumscribed ideas but surely also to a loss of revenue which is so dear to the mind of Government ; moreover the abolition of the Inspector-General means a diminution of the ' Izzat ' of the Department a ! I do not see how the needs of the Department can be laid before the supreme Government unless they have some expert adviser."

I have, I fear, wandered from the immediate purpose with which we are concerned, but I hope you will agree with me that any speech in honour of Sir William Schlich would be incomplete without some reference to the past and current history of the service for which he has done so much.

One more point, Sir William possesses in a remarkable manner the power of endearing himself to, and earning the respect of, all who come under his teaching ; he is not the dreaded professor, but rather the esteemed friend, who smooths away all difficulties and imparts knowledge, and demands and obtains affection at the same time. I have travelled a great deal in India and have met a great number of Sir William's pupils but I have never heard any but kindly memories of the old professor.

Gentlemen, I ask you to drink to the health of Sir William Schlich."

This toast having been most enthusiastically received, with musical honours, Sir William Schlich at once rose and delivered the following reply, which was most attentively listened to :—

"MY FRIENDS,—I can scarcely express the deep gratification which I feel in coming to meet you this evening, when you have gathered together to do me honour. Here I stand at the age of 71 years with 45 years in the service of the Government of India to my credit, and I thank Providence for having permitted me to be here and to thank you with all my heart for your kind greeting.

Forty-five years is a long time, and great changes have I seen during that period. When I joined the service in 1866 the Indian Forest Department was in the early stage of its development, and I rejoice at the thought that I was permitted to contribute my humble share to its progress.

At that time the Department was beset by many difficulties. Those in authority were still in doubt as to the ultimate usefulness of the measures which enthusiasts, and above all, that grand old forester, Sir Dietrich Brandis, were proposing. But the unrelenting efforts of the Department have now fairly won the battle. It is now recognised that the proper management of the forest is of the greatest importance to the welfare of the people of India, and one-fourth of the area of the country is under the management of the Department, 95,000 square miles have been declared reserved State forests, 9,000 square miles protected forests, and 138,000 square miles are as yet unclassed forests under a certain amount of control, until it has been decided whether they shall remain forests, or whether they are to be made available for cultivation to meet the ever-increasing demand for cultivated land. For, after all, the production of food is paramount.

Again we have enquired into and settled the rights of user in 98,000 square miles, surveyed 74,000 square miles, prepared working-plans for 48,000 square miles, protected against fire 43,000 square miles, and regulated the grazing of cattle. In short, we have initiated an orderly and systematic treatment of

these vast areas, with the result that the net revenue of the forests has risen from Rs. 7,00,000 in 1864 to Rs. 12 million in 1909 These are results of which we may well be proud. And we have done even more than that; we have induced other parts of the Empire to follow the example which India has set them. Members of our Staff have been asked for and have gone forth to Ceylon, the Straits Settlements, Mauritius, Victoria, New Zealand, South Africa, East Africa, Nigeria, the Soudan, Cyprus, the West Indies and British Honduras. The forests of Siam have been managed by Indian Forest Officers for quite a number of years. Even these Islands have indented on India. The Forest of Dean, the High Meadow Woods, Alice Holt Woods, the Prince's Covert near Esher and the Duchy of Cornwall Woods are managed according to working-plans prepared by Indian Forest Officers, not to speak of quite a number of private forests. The Professors of Forestry at Oxford, Edinburgh and Glasgow, and the Instructor at the Dean Forest School are all former Indian Forest Officers.

Thus we are justified in saying that the development of economic forestry in the British Empire generally has come through India. It is that country which has set the example.

My friend Mr. Beadon Bryant has, in a most generous way, told you that I had a share in this development. For the first 19 years I was active in India, as Divisional Officer, Conservator of Forests and Inspector-General, while I have devoted the remaining 26 years to the education of the recruits for the Imperial Forest Staff. Quite early in my service I came to the conclusion that the most important work to be done was a proper education not only of the superior but also of the subordinate part of the Staff. As early as 1873 I proposed that a School of Forestry should be established in connection with the Roorkee Engineering College. No action was taken on this proposal, but thanks to the action of Sir D. Brandis, the Dehra Dun School came into existence in 1878.

As to the training of the Imperial Staff, it is perhaps not generally known that I urged the Government of India in 1883

(I speak from memory) to oppose the proposal of abandoning the training at Nancy, at any rate for some time to come. However, the Secretary of State in Council decided to start at Coopers Hill, and I was deputed to institute the first British School of Forestry. It was then my duty to do my best, so as to make the new school a success. As you are aware, I remained 20 years at Coopers Hill, when, in 1905, the school was transferred to Oxford. Mr. Beadon Bryant has given you some data as to the number of students trained by me. It may be said that, by the time the Probationers now under training at Oxford have reached India, practically the whole of the Imperial Staff will have been instructed by me. This is no doubt a source of great satisfaction to me, but it includes also a tremendous responsibility on my part. Throughout this long period of time I have tried to place before my students the leading principles of forest management in such a way that they can be applied to any conditions with which they may have to deal. I think I may say that I have honestly tried to do my duty. Mistakes I have no doubt made, but who has not? On the whole I have been assured that the results are satisfactory and I am satisfied that I have been working on the right lines.

And now a new verdict has gone forth, and the few recruits for the Indian Forest Service are to be scattered over the length and breadth of these Islands. Three Universities are to be declared as being fitted to receive our few Probationers, but there is nothing to prevent three or even six others satisfying the requirements of the Secretary of State. I do not think that any one can expect my admiring that arrangement which in the last *Indian Forester* is characterised as a sacrifice of Indian interests to the desires of British Universities. Can any one suppose that half a dozen Universities will establish and maintain an efficient staff for the training of one or two Indian Probationers each a year? As a matter of fact, there is, at present, not room for more than one first class School of Forestry in these Islands, such as we require for the training of our Probationers. I have no doubt that my friend Mr. Caccia, the first Director of Indian

Forest Studies, will work the new scheme for all it is worth, but I cannot help thinking that the several Universities, however eager they are at this moment to comply with the Secretary of State's requirements, will find it rather a burden to maintain an efficient establishment when they find the small number of Probationers which each is likely to get.

There is one other subject on which I should like to offer a few remarks to you before I sit down, and that is the question of the Inspector-Generalship. I have seen various letters in the *Pioneer* showing that the question of abolishing the post seems to be under consideration. Gentlemen, I should consider it a most grievous mistake, if such a step were taken. Provincialise forest administration as much as you like, but for all that numerous cases must come before the Government of India, and to leave it to decide these without a technical adviser is simply disastrous. Nor would the abolition lead to economy, because an additional Assistant Secretary would be required to do the work. The saving would be insignificant if any at all, while the Assistant Secretary would, as a rule, know little or nothing about forestry, and moreover probably be changed every two or three years. Gentlemen, here we have a Department dealing with one-fourth of the area of the Indian Empire, or just about double the area of the United Kingdom, yielding a large net revenue, and yet it is proposed for the sake of a few rupees, to leave the Government of India without a competent adviser. This is penny-wise and pound-foolish! How the Government of India could ever propose such an arrangement passes my understanding.

But now I must not keep you longer. Let me once more say that I am deeply touched by your kindness, which I shall never forget. I shall always be very pleased to see any one of you at Oxford, where I hope to spend the remaining few years, which Providence may grant me.

Gentlemen, I drink to the health of the Indian Forest Service, and success to the efforts of the Department."

A number of other speeches by Messrs. Smythies, Branthwaite, Caccia and Lovegrove, which it is not perhaps necessary to

reproduce, followed. We should like to add that during the course of the evening a desire was generally expressed that an annual Forest Dinner should in future be held in London and it was decided to take steps to give effect to this wish. Mr. Caccia, the Director of Indian Forest Studies, residing at 19, Linton Road, Oxford, has agreed to communicate with all past and present members of the Indian Forest Service in order to put this matter on a proper footing.

NEW FOREST LEGISLATION IN ITALY.

In the last two numbers (July and August) of the *Bulletin of Social and Economic Institutions*, published by the International Institute of Agriculture, there is a special study on the above subject, from which we derive the following details :—

Previous to June 1910 when the law on the State Forest Lands was promulgated, Italian Forestry questions were regulated by the law of 20th June 1877 and some others of less importance. The law of 1877, with a view to ensuring the stability of the soil, a good water system, and, secondarily, good local sanitary conditions, forbade all deforesting and clearing of forest soil, subjecting to the *vincolo forestale* (forestry régime) the woods and lands denuded of trees on the summits and slopes of mountains, down to the higher limit of the chestnut zone, as well as those that by their character and position might, if deforested or cleared, become a public danger.

The law further instituted, in every province, a forestry committee, presided over by the Prefect, to settle the rules for forest cultivation, wood cutting and other delicate matters. But, in spite of these provisions, there was reason to lament an excessive and ill-regulated deforesting, giving rise to landslips, devastating torrents and floods, often producing serious crises in the economy of the mountain regions.

The necessity for special remedial measures was then apparent. Some of these were provided in the law of 2nd June 1910 "*On the State Forest Domain and the Protection and Encour-*

agement of Forestry"; others are contained in two bills (30th November, 1910) the first on *Modifications of the Forestry Law of 1877 and Provisions for Mountain Pastures and Agriculture*, the second on "*Forestry Training*."

The main article of the law of 2nd June 1910 is the formation of a State Forest Administration as an independent institute, "to provide for the extension of forest cultivation and the trade in national forestry produce by increasing the State forest property and rendering it inalienable and by the example of a good industrial régime."

The domain is formed—(*a*) of State forests already declared inalienable; (*b*) of State forests at present administered by the Finance Department; (*c*) of State lands held to be economically only suited for forest cultivation; (*d*) of wooded lands purchased by the Forest Domain Institute or in any way becoming the property of the same; (*e*) of treeless lands purchased or expropriated by the same; (*f*) lands reafforested or to be reafforested, by virtue of special laws, by the Department of Public Works, and that the Agricultural Department shall think fit to incorporate in the Domain.

Woods and lands that thus come to form part of it are inalienable, and must be cultivated and utilised according to a regular economic plan, approved by the Minister of Agriculture, Industry and Commerce.

Art. 17 of the law is especially interesting. It authorises the forestry administration to receive advances and loans from the Land Credit or Agricultural Credit Institutes and the Savings Banks.

For the protection of forest cultivation, it is provided that the woods belonging to the Communes, the Provinces, public institutions, corporations, associations and limited liability societies must be utilised as prescribed by the forestry authority.

For reafforestation of severely damaged woods, the Department is authorised to direct gratuitously the technical labour and to give prizes of from 50 to 100 francs per hectare.

Lands, bare or covered with bush or grass, when they are scientifically reafforested by their owners or by consortiums of

owners are exempted from the land tax for 15 years, if cultivated as copsewood, for 40 years, if cultivated for the production of full grown trees.

The central or local forestry authority further gives gratuitous assistance to the forest cultivators for the defence of small mountain properties and encourages the foundation of associations and consortiums of forest proprietors.

The sum of 33 *million francs* has been assigned for the carrying out of the *law during the first five years ;* at the end of which period the amounts necessary each year will be inscribed on the Agricultural Estimates.

To complete this fundamental law, the two bills above mentioned were presented to the Chamber. By *the first*, provision is made for a more scientific system of preserving the woods and grazing lands and for the increase of forest industries. The *vincolo forestale* is modified in accordance with the dictates of science and practical experience, and the provincial forest committee reorganised with the participation of persons technically and legally qualified. The criterium of the chestnut zone, hitherto taken as the limit of the lands of the forestry régime, is consequently abolished. Other provisions deal with the penalties and the conciliation institute for contraventions of the forestry regulations.

Finally, a very important and novel portion of the bill relates to *mountain pastures*. It establishes subsidies for the creation, improvement and regulated use of the grazing grounds and mountain meadows and for the works connected with the regulation of the water-supply. The period damaged grazing grounds must lie fallow is also regulated ; this naturally causes a break in the owner's use of them, but he receives adequate compensation during the period the State is arranging for the restoration of severely damaged grazing grounds.

The second bill has reference to "*forestry training*" : in it the foundation of a "Higher National Forestry Institute" is proposed, the principal object of which is to provide for the superior technical instruction of the forestry officers required for the service of the special State Forest Domain Institute and for the application of

general and special forestry laws. It is also proposed to institute a "Royal Forestry Experimental Station," to assist in the progress of forest cultivation by means of scientific and technical research. Finally, provision is made for secondary forestry training, itinerant teaching and for the training of the forestry guards.

(Summarised from the *Bulletin of Economic and Social Intelligence*, Year II. N. 7 & 8, July 31st & August 31st, published by the International Institute of Agriculture.)

CORRESPONDENCE.

SIR,—In the editorial on Forest Research in India in the November number, it would seem that the writer claims, on behalf of the Research Institute, the initiation of the experiment in the Thano Forest, Dehra Dun, of applying the method of successive regeneration fellings to the *sal*.

If this is so, may I be allowed to point out that the experiment forms part of the revised Dehra Dun Working-plan which was written from two to four years before the Institute was founded. The idea of applying the method to *sal* originated for one, with the late Mr. Hearle, and no one who had seen the working of the *chir* forests at Ranikhet by the same method could fail to wonder why it had not been tried with the other species. Although the Thano Forest is admittedly not a very fitting area for the experiment, it was started there for want of one more suitable and, largely, as a means of instruction for the Forest School, and, as such, it met with the approval of the late Mr. H. C. Hill.

I have not visited the forest since 1903, but I believe the original scheme, which was a rough but complete experiment with four periodic blocks, has been modified more recently.

R. C. MILWARD.

18*th November* 1911.

NOTES.

Curator for the Research Institute and College Herbarium.—We understand that the present Curator is shortly about to retire

and that the Forest Botanist would be glad to replace him by a passed student of the College with a good knowledge of Botany. The pay is about Rs. 100 per mensem and the post is on the permanent establishment. This seems a good opening for a good Botanist, and Rangers wishing for the post would do well to apply to Mr. Hole as soon as possible with the consent of their Conservator, with a view to the transfer of their services, so that their pensionary service may not be lost.

Strength of the Imperial Forest Service.—With the advent of the recruits of 1911-12 the Imperial Service will be between 30 and 40 over strength. This excess will be welcomed by Conservators, though it is doubtful whether it would have been permitted had it been foreseen.

The Kashmir Conservatorship.—Mr. Lovegrove has now returned from leave and resumed his appointment in Kashmir, Mr. Milward reverting to the United Provinces.

Madras Forest School.—We understand that the Madras Forest School at Coimbatore is probably opening this month. It will supply a long felt want in Southern India. Nearly 200 acres of land have been taken up and the total cost of the School will, we are informed, be little short of 6 lakhs of rupees.

Athletic Sports of the Imperial Forest College.—These will be held at the beginning of April. Prize cups have been indented for from England, while Sir R. W. Carlyle, K.C.S.I., and Mr. Beadon-Bryant are also contributing valuable prizes. There will be an open race of one mile or half a mile for which a Rs. 30 cup is offered. Owing to the number of good athletes at Dehra an unusually successful meeting is anticipated.

Photos of Conservators.—At the Imperial Forest College a collection of photos of all Conservators and Chief Conservators is maintained. These photos are mounted and framed and cover one of the walls. The collection is, however, not up to date. The President would be glad if all officers of administrative rank, including those holding officiating appointments, would send him a copy of their photograph, if they have not done so already, in order that it may be included in the College collection.

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A PLEA FOR ECONOMIC FORESTRY.

In Government of India Circular No. 22F, dated 19th October 1894, the general principles of the policy to be followed in the administration of the State forests are laid down and some illustrative examples cited. The foundation of the policy is stated concisely in the following quotation from paragraph 2 of the Resolution :—

"The sole object with which State forests are administered is the public benefit. In some cases the public to be benefited are the whole body of tax-payers; in others, the people of the tract within which the forest is situated."

The remainder of the Resolution shows how the interests of each body are to be weighed, and illustrates in what circumstances one or other should be given preference. For this purpose the forests are classified as :—

(*a*) Forests the preservation of which is essential on climatic or physical grounds.

(*b*) Forests which afford a supply of valuable timber (or firewood) for commercial purposes.

(*c*) Minor forests.

(*d*) Pasture lands.

It is further explained that a forest may occupy an intermediate position or fall under several heads.

The purpose of this article is to consider the position and present management of some of the forests under the second heading, those which properly are administered for the benefit of the whole body of tax-payers, and particularly some of the Himalayan coniferous forests, though the arguments undoubtedly equally apply to many other Indian forests.

The remarkably increased advantage with which Indian forests have been worked, is irrefutably shown by the great increase in the average annual revenue, *viz* :—

1873-4 to 1877-8	...	Rs. 67,23,191.
1888-9 to 1892-3	...	„ 1,51,86,115.
1903-4 to 1907-8	...	„ 2,50,55,151.

Even further progress in this direction can be expected, but I am convinced it could and should be considerably expedited without any risk being incurred, and, moreover, that it is more than doubtful whether the present policy is calculated to permanently improve the property to the greatest possible extent.

In the case of all forests which can be worked to supply more than a local market, it is a *sine qua non* that the rights and requirements of the local inhabitants are adequately provided for. This is distinctly stated in the working-plans under which most such areas are now worked. So that for the rest, in view of the policy laid down, it is desirable that forests of this class should be worked economically in its narrowest sense ; in other words, that the three agents of production (land, labour, and capital) should be employed to produce the greatest profit.

As regards land, little need now be said. It has been laid down that ordinarily permanent agriculture has a prior claim to forestry and the areas set aside for forestry in India have been chosen after due consideration of this and any indirect benefits expected. Due provision for disforestation also has been made should justification for such action arise, so that it may be generally

accepted that the land occupied by forests in India has little present value for other purposes.

The question of labour can more conveniently be considered separately with due regard to other proposals made. It will suffice here to state that the labour employed even under the most intense system of forest management is little compared with that required for the agricultural employment of an equal area and so to disclaim at once on economic grounds the grasping nature not uncommonly attributed to foresters.

It is to the 3rd agent—Capital—I wish to direct attention. By far the greater part of forest capital is in the form of growing woods, it varies in amount according to species, method of treatment and rotation, as well as, naturally, area. To obtain some idea of the magnitude of this capital, and how it varies with the rotation, it is only necessary to consider the case of an ideal forest in which all ages of trees are represented in such proportion as to provide for a sustained annual yield. In such a case if the rotation is 100 years, the value of the immature crops, ascertained by discounting their ultimate value with 3 per cent is over 30 times the annual yield. And if in the same forest the rotation were 150 years and all ages of trees proportionally represented, the value of the growing stock would be three times as great. The capital employed would be trebled. In other words, the yield with a 150 year rotation must be about three times as great as with a 100 year rotation in order to produce the same financial result. Obvious and simple as this may seem, the disregard of all such considerations is one in respect of which the present forest policy in India is open to criticism. Gratifying as the increases in revenue and surplus may be, is it not time to inquire in many cases whether the results are commensurate with the capital employed?

In the authorised book on working-plans now current in India, it is definitely stated that "financial tests of the methods of treatment have necessarily been altogether omitted." Now it is not known on what grounds such tests can altogether be disregarded in view of the above and the policy laid down. Nor is this the case in the book in question when treating of the question of the

exploitable age of trees ; the financial aspect is considered, but in a manner which is quite valueless.

After referring to the growing of the greatest volume of the most useful material (*e.g.*, firewood, poles, logs, sawn timber, etc.), it is stated that trees are exploitable when the net price realised per unit of volume standing is highest ; further, that " almost invariably the loss (in conversion) will be least when the trees are largest." From this it seems that in the case of forests grown for timber the exploitable age will almost " invariably " be counted only by the incapacity of the trees to continue growing. Reference is then made to the number of trees of various sizes which can be grown on the same area, and in an example it is assumed that the production of timber per unit of area remains constant, so that again the net price per unit of volume and, from the above, the incapacity of the trees to continue growing alone limits the exploitable age.

Finally it is stated that the correct calculation of the exploitable age is of the greatest importance, but that " Indian Forestry is not ripe for elaborate calculations and must be satisfied when the revenue is highest or the produce most useful." The latter is a primary and obvious consideration and may, for example, place the rotation of firewood-yielding forests within very narrow limits, but in the case of timber-producing forests the age-limits are wide, especially with the present development of Indian industries. In such cases then it is stated that the rotation of the highest revenue must be determined, *i.e.*, the cost of increased revenue is to be disregarded.

Admitting the impossibility of employing *elaborate* calculations, although this is not borne out by some of the working-plans now current, no argument is given for neglecting all financial tests and for employing a method of calculating the exploitable age which, if adhered to, would lead to the ridiculous result in the case of timber forest of growing the trees as long as they would live.

It is known that the rate of growth of trees is not constant and that old trees grow at a very slow rate, this in itself is sufficient reason for not indefinitely preserving old trees unless the improvement in quality makes good the falling off in quantity increment.

Again, the question of the number of stems which can be grown per acre and so the exploitability of crops as against that of individual trees is touched upon, but no means of overcoming the difficulty is suggested by the example given. It is assumed that the mean annual increment remains constant, whether the rotation corresponds to the average age of trees 1½′ or 2′ in diameter (and which of course it does not indefinitely) and the decision as to maturity is allowed to depend on the net price per unit of volume standing and this in turn on the quality of the timber and percentage of wastage in conversion. That is, in India it must depend chiefly on the percentage of wastage, for the timber market generally does not yet, at all events, discriminate as to quality dependent on changes of rotation within practical limits (say, 75 and 175 years).

No elaborate calculation is involved in applying some elementary financial test when fixing the exploitable age, and it is inconceivable that it is intended that all financial considerations shall continue to be ignored until elaborate calculations can be made.

Little mention is made in existing working-plans of the financial aspect of the rotation, and in timber forests it has been the practice to fix arbitrarily a moderate size of tree which is known to be convenient for conversion, and to determine the exploitable age from that of average trees of the size fixed. Not infrequently, however, the rotation is raised 20 to 25 per cent above the age so calculated, a precautionary measure which betrays want of confidence that protecting and tending crops in the future will produce as good results more quickly than, or even as quickly as, nature unaided in the past, indeed this is sometimes stated.

I have endeavoured to show how both theory and practice at the present time are unsatisfactory, and I now suggest one means of calculating the exploitable age which is not beyond the present state of forestry in many parts of India. In the first place, the proportion of wastage in converting various sizes of trees should be ascertained by actual conversion; this is the basis of what is laid down in the authoritative book, although it is rather suggested that such calculations need not be repeated. In conjunction with

these investigations, observations, where necessary, as to quality improvement can be recorded, and as at present the age of each tree ascertained. Provided with this information for a suitable number of trees, it is easy to apply to the case of the single trees the elementary financial test as to how long increase in quantity and quality of outturn justifies their retention. To do so, the outturn of the older tree must fetch a price, at the very least, equal to that of the younger, plus compound interest for the period it requires to attain the greater size.

The only difficulty in making this calculation is to fix a suitable rate of interest, and I suggest two means of overcoming it. Firstly, a rate commonly found suitable to forestry in other parts of the world might be applied, say, 2 to 3 per cent, and since no account can conveniently be taken of the land rental and cost of protection and tending it may be raised a little higher than otherwise thought suitable to the forests. Or, secondly, having ascertained the actual rate at which their value is increasing for different aged trees, the exploitable age can be fixed directly from consideration of these rates.

It may be objected that this is a consideration of the case of individual trees and so inapplicable to the crops that have to be dealt with. To a certain extent this is true. But are we to wait until our crops are normal before we endeavour to treat them on an economic basis? Again the information collected, provided it is obtained from a considerable number of fairly typical trees, may be applied with perfect safety, particularly to crops which are practically virgin and the production of nature unaided. For a forest crop is immature so long as it will increase in value at the minimum rate of interest required and repay the prolonged land rental and cost of management. Now, firstly, I think it should be accepted by foresters that with proper tending the desired crops can be produced more quickly than is done by nature and, secondly, if land rental and cost of management are neglected, the method suggested will postpone maturity and so provide another safeguard against over-felling. The number of trees on a given area, of course, decreases as their age and size increases, but in the method

suggested, from the fact of the lower rotation being taken into consideration, the trees which have to be removed have a market value and that can be raised and re-invested in forestry to give the required return, or, since that is always comparatively low, the revenue can be invested at least equally well in other enterprises.

I have endeavoured to show how no satisfactory means of determining the exploitable age is at present prescribed in India, and how in practice for want of some method it is generally fixed arbitrarily and a very ample margin allowed, lest it be too low, while no account is taken of the future effect of protection and tending. For these reasons and from what has been the experience of foresters in other countries, I am convinced the present rotations, 150 years and more for *deodar*, for example, will be found too high and consequently the capital employed far beyond what is economically justifiable. I now come to the annual possibility ; in India it is usually prescribed by area and in the more valuable timber forests further limited by the number of trees to be removed. In the book on Working-plans it is stated that owing to the generally irregular condition of the crops and varying competence of the executive staff, it is not sufficient to limit the fellings by area and cultural rules alone ; and that, on the other hand, the prescriptions by volume involve calculations which are not at present possible in India.

The present conditions in India undoubtedly preclude prescriptions by volume as in more regular forests in some countries, but if in a less degree, they also preclude satisfactory prescription by number of trees. The varying competence of the staff stated as the reason for requiring a check beyond area clearly implies something amiss with the training of the staff, and, if that is so, it would not seem to be a difficult matter to rectify. Certainly, experience shows that the numerical safeguard provided is not calculated to add to the competence of the staff, since for the less competent it provides an alternative to the careful application of cultural rules, and it creates doubt in the minds of many of the more competent.

The present practice is to fix the exploitable size and carry out enumeration of trees over the whole or part of the Working Circle. The possibility is then based on the number of mature trees enumerated and the time it will take to replace them, or, on the number of the next lowest diameter class which annually attain maturity and the mature trees already on the ground; in either case allowance is made for a certain number of trees never reaching maturity.

Regarding each tree as it reaches the exploitable size as one which economically should be felled, the 1st class enumerated comprises trees which, theoretically, can, at all events, be felled at once. The 2nd class trees divided by the number of years in the period in which (from ring countings) it is calculated the whole class will become mature is the annual yield for that period. As a rule, however, the whole Working Circle cannot be felled over every year in order to remove the trees which have reached maturity, so that, assuming the growing stock to be evenly distributed, half the number of years in the period it takes to go over the Circle multiplied by the annual yield must be deducted from the 1st class trees in order to ascertain what may be felled at once or in other words the true surplus. The surplus trees can be felled or, carried forward, as considered desirable, and so also can the annual yield be reduced if the state of still lower diameter classes indicates this as desirable.

The method of calculation is of considerable value in ascertaining the approximate yield of a Working Circle and allotting suitable areas for each year's fellings, but some of its modifications are unjustifiable, and when the results are given precedence over sylvicultural rules, as there is an inclination to do, its application is positively harmful.

It would be invidious to cite some specific examples of such modifications and obviously impossible to criticise all. Again the working-plans in question are often the first attempts to substitute order for chaos and their authors may justly claim to be the pioneers of economic forestry. I will only mention the case of one Working Circle where owing to faulty calculation of the

yield and the application of further safeguards it appears that the true surplus growing stock, or inadequately remunerative capital, will be increased by over 150 per cent by the end of the period for which fellings are prescribed.

Again, in the above-quoted book on Working-plans, this method of calculating the possibility is explained, and then it is stated that where the majority of the trees are mature or approaching maturity a modification is necessary, as otherwise "practically the whole forest capital would be removed in a single period." Disastrous as this sounds, what can be the use of retaining capital which is no longer paying interest, or at all events very much too little. How soon unremunerative capital should be replaced by remunerative should depend on sylvicultural considerations alone provided the former can be realised, and if it cannot, then it is better to concentrate the labour available on the more valuable areas until the law of tendency to diminishing return operates.

But, it may be said, the markets will be flooded, there will, in the course of a number of years, be a falling off in the outturn of produce.

To the first argument I reply that the limitations of the markets must be properly gauged, *i.e.*, by calculation of the minimum price which can be accepted and employed to better advantage than by the retention of overmature trees in the forests. These limits do not seem likely to be reached so immediately, when it is considered how timber prices have risen, how inferior timbers are finding a market, how foreign timber can be imported at a profit, and how iron is already frequently being substituted. When, if ever, the limit is reached, fellings can be restricted, but then surely it will be better and more profitable to work smaller areas of the more accessible and valuable forests to their advantage, economically and sylviculturally, than to have modified fellings which are economically unsound, and only too often sylviculturally unsatisfactory, over large areas.

As a matter of fact, it is not so much a fear for the markets as an exaggerated conception of the immediate necessity for absolute regularity in the forests and their yield which is influencing Indian

forestry. And, if this were the ultimate aim of Indian forestry, I doubt whether the present method is even the quickest to attain it. With markets in their present condition and forest crops very irregular, I have no doubt slight irregularities of supply, which it might be impossible for Conservators to avoid if the possibility were fixed by area alone, would not dislocate the markets, while, on the other hand, increased supplies would lead to their exteusion.

So far as the possibility of a falling off in the outturn of produce is concerned, the optimistic view should at least carry as much weight as the pessimistic, when considering the probable results of professional tending and protection ; and there seems no reason to hoard up India's timber wealth in order to stave off a time when she will have to content herself with the most her forests can be made to yield permanently.

As regards the sylvicultural aspect of the question : to induce regeneration of the desired species under any shelter wood system (the cheapest if successful) the fellings must be made with due regard to the sylvicultural requirements of the species and the varying quality of the locality ; their intensity cannot be laid down mathematically for a single coupe, far less uniformly for all coupes in Working Circle. Disregard of this must lead to favouring the regeneration of more shade-bearing species where the fellings are too light and *vice versâ*.

To recapitulate, it is obvious that virgin forests are likely to contain a preponderance of trees mature or approaching maturity (in many cases never likely to attain it) and that consequently such forests are bearing the burden of excessive capital ; with such forests abundant and no attempt to calculate the proper extent of capital on an economic basis, there is a natural tendency to caution in modifying nature's methods and consequent over-capitalisation. There is no justification for rigid Working Plan prescriptions which place, or have the effect of placing, regularity of yield before all else, this is particularly striking when it is considered for what vast quantities of serviceable timber a market has yet to be created ; and finally it betrays a want of confidence in the sylvicultural principles which have been established.

To summarise the present position, the progress of forestry in India has been so great that the attempt to apply systematic forestry to vast areas beyond what the staff available can control, has only too often resulted in an apology for sylviculture and neglect of primary business principles. Not economic forestry but consumption, regulated but generally timid, has resulted with production almost entirely left to nature. Some relief has been sought in the sale of trees standing in place of exploitation by departmental agency, but such relief is neither satisfactory nor adequate so long as the purchasers are unaccustomed to the work or not quite reliable, and by the time they are, it is certain the deficiency of professional labour will be even greater than now.

Profit and loss are measures of economic employment of the agents of production; assuming that in Indian forestry the land may be left out of consideration as having little or no value for any other purpose, is it right that the annual surplus should be taken as the measure of successful administration except of the undertaking in its absolute infancy? It takes account of the labour employed, but entirely neglects the capital. Yet the surplus remains the layman's standard of judging the progress of the Forest Department much to the annoyance of many a forest officer who has endeavoured to make the capital employed in his forests permanently more remunerative, instead of being content with more extensive lumbering. It seems to me that this misconception needs to be removed and regular and permanent progress and a claim to a considerable strengthening of the staff sought in demonstration of sylviculture on an economic basis.

A. D. BLASCHECK.

STRENGTH OF PLANTATION AND NATURAL-GROWN TEAK IN SOUTH INDIA.

The following extract from a letter from the Forest Economist to the Conservator of Forests, Southern Circle, Madras, has been forwarded to us :—

COMPRESSION TESTS.

Log No.	Specimen No.	Size of piece tested.	TOTAL WEIGHT APPLIED IN TONS.		PER SQUARE INCH IN TONS.		MOISTURE AT TIME OF TESTING.	
			Plantation.	Natural.	Plantation.	Natural.	Plantation.	Natural.
1	a	2" × 2" × 4"	15·24	12·70	3·79	3·19	Not recorded.	...
	b		13·81	13·54	3·45	3·39		
2	a		14·12	14·22	3·53	3·56	16·29 % on 10th April 1911.	...
	b		15·47	13·72	3·87	3·43		
3	a		14·57	12·64	3·64	3·16	Not recorded	...
	b		14·36	12·75	3·59	3·19		
4	a		14·90	13·93	3·72	3·48	Not recorded.	20·01 % on 10th April 1911.
	b		14·33	13·30	3·58	3·32		
Average...	...	...	...	...	3·65	3·34	...	...

SHEARING TESTS (SHEARING TOOK PLACE AT TWO DIFFERENT POINTS IN EACH PIECE).

Log No.	Specimen No.	Size of piece tested.	Total weight applied in tons.		Per square inch in tons.		Moisture at time of testing.	
			Plantation.	Natural.	Plantation.	Natural.	Plantation.	Natural.
1	a	1" × 2" × 4".	3·22	3·48	·805	·870	...	...
	b		3·57	2·80	·892	·700		
2	a		3·24	3·58	·810	·895	6·29% on 10th April 1911.	...
	b		4·50	4·00	1·120	1·00		
3	a		3·84	3·75	·960	·938	...	...
	b		3·62	3·64	·905	·910		
4	a		3·93	3·32	·982	·830	...	20·01 % on 10th April 1911.
	b		2·85	3·04	·760	·760		
Average...	...	...	...	...	·904	·863	...	...

TESTS FOR TRANSVERSE STRENGTH.

Log No.	Specimen No.	Size of piece tested.	Total weight applied in tons.		Per square inch in tons.		Moisture at time of testing.	
			Plantation.	Natural.	Plantation	Natural.	Plantation	Natural.
1	a	2" square and 20" long.	1·56	1·54	5·85	5·77	...	...
	b		1·44	1·60	6·40	6·00		
2	a		2·02	1·63	7·57	6·11	...	...
	b		1·60	1·47	6·00	5·51		
3	a		1·79	1·68	6·71	6·30	...	...
	b		2·00	1·75	7·50	6·57		
4	a		1·47	1·62	5·51	6·07	...	...
	b		1·97	1·60	7·39	6·00		
Average...	...	...	...	...	6·62	6·04	...	...

"The figures of all three tests show the *plantation* slightly stronger than the *natural* teak. I put this difference down to the 4 per cent. excess moisture in the latter samples. It is a point of considerable interest. I would ask you to allow me to draw your attention to my remarks on this subject on page 3 of my Forest Bulletin No. 3 of 1911 on the subject of Plantation and Natural Teak in Burma. Again, though no true comparisons can be drawn between Burma and Nilambur plantation teak, as the localities are different, it is interesting to note that Burma plantation teak with 10·83 per cent. of moisture as against 16·29 per cent. in the Nilambur product, gave slightly higher results for test of transverse strength. In the compression tests the effect of moisture is not so important a factor, while in shearing tests it may possibly be that moisture increases the power of resistance."

OUDH AFTER BURMA.

It is five o'clock and I wake suddenly as a lamp is brought into the verandah to light my friend to his *chota hazri* displayed on a chair at his side. Outside the chaprassis are already practising their exercises for the throat which seem to do their voices so much good, and enable them to hear each other distinctly when conversing at the top of their voices at a distance of three yards. S. likes his tea before he washes his face, and I like to wash my face before I have my tea, so I get up to do so. We are off to-day to see an outlying part of the forest and start on the elephant at half past five. Elephants are gentlemen (or ladies) in Oudh and do not have to carry vulgar loads of miscellaneous camp kit. We sit on a platform made of a sort of bedstead upside down lashed to the pad, but as soon as we have left the dusty roads near the rest-house I get off and walk as the motion is trying when long continued. Not so trying as a howdah, however. During my first two days on a howdah I stood a good part of the time so as to adapt myself to the motion as much as possible. Of course the further one is above the elephant's back the more the motion is exaggerated, so one sees most people travel on the pad elephant

and go into a howdah only for shooting. The country is flat and not a hill is seen nearer than the mountains of Nepal far in the north, rising up to the distant snow-covered tops of the highest. The jungle is very open, and from the top of the elephant the view is extensive and field-glasses most useful. A mile out we see a solitary pig running across, dodging behind the crooked scattered cutch trees and through the tufts of coarse grass. He reaches a flat open grassy hollow and canters steadily away through this, disappearing half a mile off in a green thicket of *Trewia* and *Eugenia*, which runs at an angle with our line. We pass the end of it directly and see a dozen spotted deer standing on its edge. They have seen the elephant afar off but stand while we examine them with the glasses. Rather like fallow deer they are and this lot has no stag with them. In May one has to be careful as some of them are in velvet, though most have mature horns. For a couple of miles after this we jog along through open grassy land with middle-sized *Bombax* trees standing here and there among the more plentiful scrubby cutch. Then far on the left my companion spots a nilgai or blue-bull. He is standing close to a tree and staring at us. We alter our course a little and make a line to pass one side of him, and in this way get up to about a hundred yards distance. Then he bounds off but S. has stopped the elephant and got a shot before he has gone many yards and drops him. The elephant, which took no notice of the shot, is pushed ahead but he is up again and off—to fall again to a closer shot and wait to die decently at the hands of the Mahomedan mahout who administers the *halal* and makes the meat eatable for all the Mahommedans in camp. Some Hindu wiseacre long ago christened the animal a blue cow so that no Hindu will touch the meat, though he is an antelope and not at all a cow. On another day we got a big bull nilgai which died before the mahout could reach him, so that hardly a man in camp would touch him. He is a curious shaped animal, blue gray in colour and very high in the withers so that he looks strangely foreign cantering away through the grass. His horns are short and form little of a trophy, but nilgai are shot fairly often to keep their numbers down, as they

are most destructive to the outlying unfenced crops. In the hot weather they seem to keep mostly with their own sex as we saw bulls in twos and threes and once nine together. The cows are smaller and grayish in colour, and a big bull with shoulders and crest like a Clydesdale stallion stands well above them. His knees are bare like a goat's, though it is not likely that he kneels to graze as a goat does. His skin makes excellent leather for camp cots. A message is sent to a village for a cart to bear the meat to camp and we go on and enter a stretch of small tree jungle. Soon we stop suddenly and the mahout who has been looking ahead points out a spotted deer standing motionless with braced legs watching us. It is my shot and it is not difficult to drop him on the spot with a shot behind the shoulder, a medium-sized head and my first. Having been duly *halaled* he is hoisted on to the elephant with his bound legs over the short wooden pillars which stick up at each corner of the pad, and there he hangs over the elephant's tail. We swing round in a semi-circle to see some other forest and on the way home have a good look at some forty or fifty spotted deer walking slowly along under the trees. The spots show up well on the light coloured hides of the does and the darker coats of the stags. They are all alarmed and stand still to stare, but the stags, of which we count nine, seem small and they are left in peace. A day or two later near the same place I saw a herd of about twenty-five containing a very good stag. By getting off the elephant and doing a long stalk, I got quite close to them and watched the herd move slowly away but there was no sign of the big fellow. On my right was a patch of very high grass and suddenly as I stood he burst away through it and gave me a chance which I missed. He had been standing motionless less than 10 yards from me.

It is hot in Oudh in May so when we get back we find the rest-house shut up, with chicks on all the doors and windows. The building is of masonry, two rooms downstairs and two upstairs with verandahs, and the walls are 2 feet thick. They treat themselves to a good deal more furniture than we do in Burma, and we can spend the day until four o'clock comfortably inside and hardly

need a punkah. Coming in from the forest one sometimes sees the bungalow a couple of miles off on the plain, showing up large and white above the small scattered trees with a few better sized *Bombax* near by, which provide a little shade for tents. It is remarkable how this tree comes up from seed on these plains wherever a small thicket of thorny *Zizyphus* protects it from the enormous herds of white cattle which graze here. These are furnished with a very useful looking pair of sharp horns, and though the ordinary cow is quiet and harmless enough, when the herd is angry, as the babu said, they will not do so. On one occasion several of us on elephants passed a large herd which had been excited by the cattle-men shouting to them in a peculiar way. They are said to do this when a leopard or other danger is near, and the cattle were circling round the men in large droves. They looked rather formidable, but from our elevated position we were able to look down on them with scorn not mingled with derision! Smaller herds of buffaloes showing most of their bones are also common and among them a number of the bulls have light coloured hair on the forehead and China blue eyes. They compare very badly with the Burmese buffaloes, and wear instead of wooden bells very long brass or copper bells which ring through the forest with a sound like the bell of a Free Kirk in the Highlands. They graze all over the enormous *phantas* (open spaces) which occur in the *sal* and open forests. In some parts the *sal* occupies the high land right up to the edge of a sort of plateau, where there is a drop of 20 to 30 feet down a fairly steep bank and the open forest begins. The *sal* forest is mostly dense and divided up by straight lines which vary in breadth up to 100 feet, and often radiate from a bungalow whence the divisional officer sallies out in his trap along the lines when the road happens to be good enough. The *sal* looks rather like *ingyin* and there seem to be few trees above 6 feet in girth. Not far from one of the rest-houses was a very large *phanta* or *lwin* where a small village had a patch of wheat fields. On a couple of evenings we went out here to look for black buck and though we saw a good many we did not bag anything. They seem to live in small herds of two or three, or a dozen or

twenty together, but on one occasion I saw a solitary buck. The bucks are easily distinguished by their long horns and black backs, the does being much lighter in colour. They keep entirely in the open and when fired at the herd makes off, each animal leaping high in the air. I got one finally by walking more or less in his direction and taking a shot at about 100 yards, but he moved as I fired. As he bounded away a second lucky shot brought him down. It is pretty shooting and not so often successful as to get stale. He fell just outside the reserve boundary, which is marked by white masonry pillars running in a line across the grass land with a ditch joining them. His horns were fair for the U. P. where they do not seem to run so long as in the Central Provinces. Through the flat land runs a muddy winding stream and here, as in others like it, are found both the long-nosed Ghariyal (fish eating crocodile) and the Mugger. The former is common and 6 feet specimens may be seen in patches of half a dozen on the mud banks during the heat of the day. My friend had a long shot with a telescopic sight at a twelve-footer and hit him in the only vital spot, rather far back in the neck. If hit anywhere else they usually struggle back into the water. The snout is long and narrow and furnished with rows of most useful looking teeth. They are very wary and, however log-like they may appear, usually gently subside into the water at the first sight of danger in the distance. Their skins make excellent leather. On the far side of the small stream is a patch of pure white on the open ; as we get near it turns out to be a flock of white cranes with some spoon-bill storks and ordinary black and white storks. These and the black red-headed ibis are very handsome birds, and may be seen in small numbers in many places near water, with the big blue red-headed crane and the pelican. But the peacocks are the bird of Oudh above all others at this time of year. Hundreds may be seen from any camp and every fourth bird has a magnificent tail. One only I saw disporting himself with his tail up, probably we were rather late in the season for this performance, as egg-laying had begun and nests were to be found. The common plover is as noisy and irritating as he is in Burma, and I watched one chasing a brown

monkey away from the grass, where his nest was probably hidden, with vicious dives and pecks. These ordinary monkeys are common, usually on the edge of the tree forest wandering along the ground in flocks. The langur, the grey monkey with bushy white whiskers is also common and is a much handsomer beast. The crows led us one day to the remains of an old one which had probably been killed by a panther and we found the clean picked skull, very human except for the large canine teeth. We did not shoot any birds as the nesting season was on, but saw the large handsome swamp partridge, something like an English partridge but much larger, the black partridge or francolin resembling the Burmese *Ka* but blacker, and the small grey partridge. The black partridge calls much as the Burmese bird does, but his voice is weaker and not so harsh. A few quails and snipe were seen and the goggle-eyed plover which I had seen once or twice in Upper Burma and watched for some time, at a loss to name it. On one beat we put up a florican (bustard). Vultures abound and find plenty to eat with such large herds of cattle on the ground. These die off in hundreds in an unfavourable season, as during the rains of last cold weather, and the forest revenue is increased by the sales of the right to collect bones and horns. One morning we got near to a large herd of spotted deer, which were accompanied by half a dozen blue-bulls. One of each was shot and we waited a while to see what the deer would do as they were quite in the open and apparently did not know what to make of the shots. Within a minute a dozen vultures were down at each, and we had to stand by both corpses and keep them off until the men came up.

By wandering round the jungle in this manner, mostly on an elephant, one may see at times an extraordinary number of animals, but the people living in the province who shoot do most of their shooting by beating. I was fortunate in being asked to attend several beats with a party of half a dozen who had brought up a dozen elephants, and although we were not very successful, most of the beats brought out animals of sorts. I saw spotted deer, swamp deer, peacocks, a mongoose, pig, hyenas and panthers come out, but none of the stags were worth shooting. The first hyena which

I saw through the jungle made me sit up as the yellow striped skin at the first glimpse glanced through the trees like a tiger. In his beat another lucky hyena would probably have been killed by a sportsman who had unfortunately forgotten to put a cartridge in his rifle. On asking the Hindustani name of the animal on this occasion I was told that it was *lakarbagha*. They are said to come and interfere with kills now and again. Near one of the rivers were some large stretches of low tamarisk scrub in which we had some beats for swamp deer sitting on native bedsteads tied upon slender poles but although a fair number came out, they were all does or very poor stags, as apparently the good stags nearly all drop their horns by March. The whole herd swam across the river after one of these beats to escape. Sambur seem to be rare in the flat country and barking deer not nearly so common as in Burma. Hog deer we saw occasionally but none with heads. The beating was usually done by 30 to 40 men with half a dozen elephants and they made a fair amount of noise. Two panthers which were shot in a beat must have been lying not far from the *machans* beyond the first beat, as they came out in the second beat which was towards the same *machans* from the opposite direction and were both killed by one gun. They had been located in the neighbourhood as they killed a goat tied up not far off. Snakes seem to be extremely rare or they keep in cover during the heat, but I saw a couple of big lizards. They make when disturbed for hollow trees, in one of which some one had cut a window 6 feet up which he duly looked out of to see if I was still there when I had chased him up it. They seem to be remarkably sound sleepers. In Burma I remember finding a large one at the bottom of a pool and I had to give him several severe prods with a stick before he would bolt, and in Oudh we found one asleep in the sun on the grass where he stayed until the elephant nearly trod on his tail. Oudh remains to me a place of great spaces and distant views, in the open forests and down the long *sal* forest rides. Round the few villages wheat fields are being reaped and a fire-watcher's hut is met with now and again. In the hot weather the felling has stopped and few people are about, and in the rains everyone leaves the forests and

rests in healthier spots. I suppose there is nothing more peaceful than a railway station far in the coufitry at home on Sunday, and it came back to me as I spent part of a day waiting for a train at the end of a railway line near the Nepal border, where the line simply stopped half a mile from the bank of a river near a wheat field without building or telegraph line. The one train of the day arrived about eleven and slept there till two, when it went back, taking away a few almost empty carriages and some trucks full of wheat. I put a table and a chair under the one tree which provided a little shade and basked there, in the silence and the heat, like a vegetable-marrow, until the train left.

In Oudh (of course all this time I am speaking only of what I have seen), you can hire as many carts as you like at eight annas a day, you can buy a sheep for one rupee and a half grown buffalo to tempt a tiger for five. You can get as many men as you want at seven rupees a month, you can go out and see more game in a week than you would in Burma in a year, with a tenth of the trouble, and you can take your ease in a pukka bungalow furnished with every luxury—but Burma has its points too.

A. R.

PAPER-PULP IN JAPAN.

The quantity and value of pulp imported into Japan during the three years 1908—1910 was as follows :—

	Quantity.	*Value in Rupees.*
1908	... 18,224 tons.	27,79,000
1909	... 16,685 ,,	24,11,000
1910	... 35,651 ,,	48,49,000

RE-DISTRIBUTION OF FOREST DIVISIONS IN THE MADRAS PRESIDENCY.

The following is the re-distribution of forest districts in Madras due to the formation of a fourth Circle :—

NORTHERN CIRCLE.
Head-quarters, Waltair.

		Forest area sq. miles.	Classed as
Ganjam	...	598	Major
Vizagapatam	...	302	Minor
Lower Godaveri	...	482	Major
Upper ,,	...	428	Minor
Kistna	...	297	Minor
East Kurnool, West ,,	...	2,640	Major
South ,,			Major
Total	...	4,747	

CENTRAL CIRCLE.
Head-quarters, Madras.

		Forest area sq. miles.	Classed as
Guntur	...	814	Major
Nellore	...	737	Major
East Cuddapah	...	1,083	Major
North ,,	...	736	Minor
Bellary	...	690	Major
Anantapur	...	782	Minor
Chittoor	...	840	Major
Chingleput	...	213	Minor
Total	...	5,895	

SOUTHERN CIRCLE.
Head-quarters, Trichinopoly.

		Forest area sq. miles.	Classed as
Vellore, North	...	500	Minor
Do. South	...	751	Major
South Arcot	..	346	Minor
North Salem	...	839	Major
South ,,	...	587	Major
Trichinopoly *cum* Tanjore		360	Major
Madura	...	666	Major
Ramnad, Tinnevelly	...	439	Minor, Major
Total	...	4,488	

WESTERN CIRCLE.
Head-quarters, Coimbatore.

		Forest area sq. miles.	Classed as
Kollegal	...	705	Minor
North Coimbatore	...	919	Major
Central ,,	...	351	Minor
South ,,	...	457	Major
South Malabar	...	227	Major
North ,,	...	262	Major
Nilgiris	...	568	Major
South Canara	...	986	Major
Total	...	4,475	

"NATURAL-BORN BRITISH SUBJECTS."

At a meeting of the Viceroy's Legislative Council the following question was asked by the Hon'ble Mr. Sachchidananda Sinha :—

(*a*) Is it a fact that in the rules lately published in regard to appointments in the Indian Forest Service, it is laid down that candidates applying for appointment as probationers must be "natural-born British subjects?"

(*b*) Is the above expression precisely the same as "the natural-born subjects of His Majesty?"

(*c*) If not, will the Government be pleased to state whether the expression "natural-born British subjects" includes or excludes the Indian subjects of the King-Emperor?

(*d*) If the latter, do the Government intend to so amend the rules as to make Indians also eligible for all appointments in this department, equally with other subjects of the Crown?

The Hon. Mr. Carlyle's reply was as follows:—

"The reply to clauses (*a*) and (*b*) is in the affirmative, and the expression 'natural-born British subjects' includes Indian subjects of the King-Emperor."

THE FORESTS OF THE PHILIPPINES.

BY H. N. WHITFORD, Ph.D., 1911.

This publication forms Bulletin No. 10 of the Bureau of Forestry, Manila, whence it can be obtained for about 4 rupees. It consists of two parts, *viz.*, I.—*Forest Types and Products*, and II.—*Principal Forest Trees*, and, as is the rule with American forest literature, it forms an attractive publication measuring 9″ × 6″, well printed on good paper and with numerous excellent illustrations. It is of special interest for Indian forest officers seeing that the types of vegetation described closely resemble those of an Indian forest and contain a number of identical species. The chief object of the bulletin is to draw attention to the field available for the successful investment of capital in exploiting the forest resources of the Islands,—"it is estimated that the forests properly managed can be made to yield 2 billion board feet annually, without being damaged. This will allow a rotation of 100 years. While there is no prospect of the full utilisation of the forest wealth in the immediate future, with sufficient investment of capital, there is little reason to doubt that within the next ten or fifteen years the annual output of timber in the Philippines will reach the 500 million mark."

The total area of the Islands is given as 120,000 square miles which consist of :—

Virgin forests	...	33 per cent.
Second-growth forests	...	17 ,,
Grass-lands	...	40 ,,
Cultivated land	...	10 ,,

The extensive grass-lands are said to be occupied chiefly by *Imperata exaltata* and *Saccharum spontaneum*, but the possibility of utilising these species for the manufacture of paper-pulp appears not to have been noted. These grass-lands are said to have arisen from a system of shifting cultivation and the repeated firing of such areas prevents the re-establishment of woody species. It is pointed out that successful cultivation of these grass-lands is very expensive and that many Filipino farmers first plant seeds of some small rapid-growing trees, allow them to grow and shade out the grasses, then cut and burn the wood, and plant their crops.

In the natural reforestation of the grass-lands *Pinus insularis* is the chief tree in the high regions and in the lowlands the following familiar species first come in : *Antidesma ghæsembilla*, *Bauhinia malabarica*, *Eugenia Jambolana* and *Albizzia procera*. It is noted that "the prevention of further destruction of the virgin forest, and the reforestation of the grassy regions on non-agricultural lands, both by the prevention of fires and by planting, are the greatest forestry problems of the Philippine Islands."

The climate of the Islands varies considerably. June—October is the rainy season, but the annual rainfall varies from 36″ to 160″ in different localities. In some localities there is, and in others there is not, a pronounced dry season. In the former the forests are more or less deciduous, in the latter they are usually evergreen.

The outstanding feature of the forests is the pre-eminence of trees belonging to the family *Dipterocarpaceæ*. It is estimated that forests of the dipterocarp type occupy 75 per cent of the total area of the virgin forests and that 70 per cent of the total standing timber in the Islands is produced by trees of this family. The chief trees belong to *Shorea*, *Dipterocarpus*, *Pentacme*, *Parashorea*

and *Vatica;* practically all of them are large trees, the largest attaining a height of 200 feet and diameter of 7 feet. The yield varies from 20 to 450 cubic meters of merchantable timber per hectare, and as these species usually occur in pure woods, they are adapted for lumbering on a large scale. It is pointed out that "the quality of the dipterocarps, which permits them to bear shade, is thought to be the main cause of their success in occupying large areas in the better soils," also that the dipterocarps "have soil moisture requirements that will not permit them to exist in the drier soils of the limestone regions."

Where the water-level is near the surface in forests of this main type, *Pterocarpus indicus, Terminalias, Celtis, Erythrina indica, Macaranga, Mallotus, Albizzia, Hopea, Dillenia* and others appear.

The only dipterocarp which is noted as being wholly deciduous (and this only for a day or two) is *Anisoptera thurifera* which is found in localities with a pronounced dry season. At an elevation of 400 to 900 meters *Shorea polysperma* occurs in association with oaks and forms a sub-type of forest.

Above 900 meters the "mossy-forest" type is found, which contains *Dacrydium, Podocarpus, Eugenia, Quercus, Myrica, Engelhardtia, Acronychia, Symplocis,* and others. The trees here are dwarfed and do not, as a rule, exceed 5 meters. Few mountains in the Philippines attain a height of more than 2,000 meters.

Other forest types are the *Molave (Vitex parviflora)* which extends up to 150 meters, the Pine (*P. insularis* and *P. Merkusii*) which is usually found above 900 meters, the Mangrove between low and high tide, and the Beach (containing *Terminalia catappa, Erythrina indica, Pongamia glabra, Thespesia populnea* and others) near sea-level.

It is noticeable that neither the Sal nor the Teak is indigenous in the Islands, although the latter has been planted to some extent.

The principal uses of the various timbers are detailed, with notes on weight, hardness and the results of mechanical tests. Information is also supplied regarding minor products markets, existing methods of logging, milling, transport, labour and charges

The felling regulations consist in fixing a minimum diameter limit' while "where there is danger of the extinction of valuable species, the Government reserves the right to select the trees to be cut." A map of the Islands indicating the approximate distribution of the chief forest types concludes Part I.

It is estimated that the forests contain 2,500 tree species but many of these, even of the dipterocarps, have not yet been botanically determined or defined, while considerable areas still remain to be explored. In Part II, however, popular descriptions are given of 106 of the principal trees which are at present exploited. The descriptions are amplified with excellent illustrations, indicating the general characters of leaf, bark, infloresence and fruit of most of the species, and aim at facilitating identification by means of easily recognised field characters. The inclusion of a scale would, we think, have considerably increased the value of these plates. Sylvicultural notes, chiefly dealing with soil and light requirements, are added, together with details of economic uses, distribution and local vernacular names. Vernacular names are used freely throughout the paper and a complete alphabetical index of these giving the scientific equivalents with references to both parts would have been useful.

Copies of the bulletin can be obtained from the Bureau of Forestry, Manila, P. I., for $1·25 gold (about 4 rupees) post paid. Seeing that the bulletin contains no less than 131 full-page plates, the price is clearly very moderate.

In many respects the present publication admirably fulfils the function of a local Forest Flora designed for the use of the practical "forester or lumberman," who is not necessarily a botanist, and the system of profuse and cheap illustrations is one that might be adopted with advantage in the preparation of our local Indian Forest Floras. The first object of such books must be to enable any one, who is interested in the forest, to easily identify the most important species composing it. Armed with this knowledge he then has at his disposal all the available information, botanical, sylvicultural, or economic, which up to date has been placed on record regarding the various species. The knowledge of the

forest thus widely disseminated must not only inevitably result in increasing the exploitation of its products, but, by adding to the number of interested observers, will no less certainly lead to the accumulation of valuable additional facts and information. Such books, which could be quickly and cheaply revised and brought up to date from time to time as knowledge accumulates, will eventually render possible the preparation of a complete Forest Flora of the best type, which would contain in one place, for convenient reference, reliable and practically complete information regarding each species and which would serve as a classic for many years.

Such a book would contain a digest of the principal results obtained by the united labours of the forester, sylviculturist, systematic botanist, ecologist, mycologist, entomologist, chemist and economist, and must be the ideal of every one who desires the true welfare of the forest, or who wishes to acquire any knowledge, other than superficial, of the species which compose it.

SPRUCE YARN.

The expression "mahogany overcoat" used to be employed as a sort of synonym or euphemism for "coffin"; but if things keep on as they have started under the impulse of inventive genius, we may soon hear of "locust-shirts" and "bass-wood collars" and even "long-leaf pine ulsters." The Germans have long since endeavoured to make themselves independent of foreign sources for the various raw materials which they require for their own home consumption, as well as to manufacture for export, and now we hear that there has been made of spruce wood a yarn that is quite spinnable. Whether this is a "yarn" or not, cannot be said, but on the authority of *Der Holzkäufer*, which is many times removed from being a comic paper, and in fact revels in the most wooden of statistics for the foresters and lumber dealers of Germany the formidably named "Aktiengesellschaft fur Garnfabrikation" of Berlin has for some time been having experiments made on the same lines as those which have resulted in the

production of artificial silk and cotton ; and the result seems to be gratifying, as spruce is comparatively plenty in the "Fatherland," while as yet (there being no Luther Burbank on her rolls) cotton and silk are not numbered among the productions of Central Europe. The new product is said to have a fine finish and much better surface than is usual with the natural fibres as yet used for spinning. The Technische Laboratorium fur Material-prufungen of the Technical School for Textile Industries in Reutlingen has shown that when leather feed-rolls are used, the new yarn when used as warp or chains is 12½ times as strong as jute ; and when used as woof or fillings, 30 times as strong. As against jute, "sylvalin" has the very great advantage of being odorless, even when moist. Articles woven therefrom are naturally not exposed to the attacks of moths. If all these things are true, and the process is not too expensive, there must be a good future for the new yarn, especially if (as is said) it can be worked with all the usual other fibres. The first attempts at weaving have been with wall tapestry, which are most satisfactory in pattern and color, and have the great advantage of being so smooth that dust does not attach itself thereto as readily as to other stuffs used for the same purpose; also, that in brushing them down they do not get rough. So-called Japanese mats have been made of sylvalin, and are hardly to be distinguished from those made of rushes. There is this great advantage on the side of the sylvalin yarn, that it may be woven in the loom ; whereas by reason of the shortness of the individual pieces, rushes can be worked up only by hand. The new material has also been made up into cord of various kinds, alone and in combination with other materials, for decorative and other purposes.—[*Scientific American.*]

WHY AMERICAN PRAIRIES ARE TREELESS.

Prof. B. Shimek, of the State University of Iowa, has been studying this question in Iowa, where the treeless prairie originally covered more than seven-eighths of the total area of the State. He finds that the absence of trees is not due primarily to the soil or the topography, nor to such causes as prairie fires, the former abundance of the bison, etc., but is an effect of climate. Moreover, it is not due to a deficient rainfall, so much as to an excessive rate of evaporation. "The prairie areas are uniformly so situated that they are fully exposed to the factors which cause rapid evaporation, namely, the sun and the wind. During much of the year they may present conditions quite favourable to plant-growth, but there are seasons and there are portions of the year, especially in midsummer, when evaporation and consequent dessication become so extreme that only those plants which are especially adapted to dry regions can survive."

PETRIFIED FOREST GIANTS.

Three petrified redwood trees, that have been pronounced the very largest in the world, that have thus far been discovered, have just been uncovered from the *débris* of the mountain-side, only a short distance from the famous Bohemian Club Grove, in Sonoma County, California. This point is near the little town of Occident. One of these pre-historic monsters, that make the pyramids of Egypt modern, by comparison, in their ages, measures 23 feet in diameter and is 350 feet in length. The other two petrified trees are 13 and 12 feet in diameter, respectively. The very largest petrified trees yet discovered, near Calistoga, Sonoma County, California, is only 12 feet in diameter. These three trees lie on a wooded hill pointing due north and south. The petrifaction is most remarkable, the grain of the wood, and in one of them the decaying heat, being very plainly discernible. Surrounding these petrified trees is standing a forest of very large redwoods. However, all of the standing trees are dead. The owner of the land on which these three great petrifactions lie, is now having the *débris* all cleared away, so as to fully expose the giant trunks, and an iron-railing will protect them.—[*Scientific American.*]

FORESTRY AS A CAREER.

The following correspondence may be of interest to our readers, who can form their own conclusions on the subject. These letters appeared in the *Timber Trades Journal*:—

Mr. E. P. Stebbing, Head of the Forestry Department of the University of Edinburgh, writes the following letter to the *Daily Mail*:—

SIR,—All forestry experts are agreed that afforestation in Great Britain will prove a remunerative industry and will tend to keep the people on the land. It may be asked, then, Why does not Government take up the matter on a large scale?

The answer is to be found in the first of the principles drawn up by the Development Commissioners to regulate the applications for grants of money from the public funds for forestry purposes in Britain (omitting Ireland).

The principle reads thus (*vide* First Report of Proc. of Dev. Comm., 1911): "That the first requirement for forestry development is effective education in forestry at suitable centres regulated by organised research and demonstration." Clause 2 reads: "That no scheme of State afforestation on a large scale can be considered . . . until a trained body of foresters becomes available."

Last year you were good enough to grant me a short space in the columns of your valuable paper to enable me to draw attention to the educational advantages Edinburgh University affords for a thorough training in forestry, the University granting a degree in the science.

As a result of your kindness I have received large numbers of letters from parents all over the country asking for further details regarding the Edinburgh course, and also as to what chances there were of the qualified forester obtaining employment when he had secured his degree.

The answer, I venture to think, is to be found in the above extracts from the principles enunciated by the Development Commissioners. We are plainly told that money will be made available

for afforestation purposes when a sufficient body of trained foresters exists. Centres at which this training is given exist.

Edinburgh University, with its unrivalled Science schools, its unique situation, which enables the student to visit extensive, valuable educative woods, both in Scotland and in the North of England (woods non-existent in the south), with its forestry degree and the small cost for which it can be obtained. Edinburgh is admittedly in the first rank of the forestry educational centres of the country.

The centres being there, it remains for the youth of Great Britain to come forward to be trained for a profession at once the most interesting and healthy a Britisher can follow.

To Editor of the *Timber Trades Journal.*

Sir,—Professor E. P. Stebbing's letter on the above subject in the *Daily Mail*, which you reproduce in your issue of September 23rd, raises a rather important question for the youth of this country who may be contemplating taking up forestry as a profession. The existence of the Development Grant Fund, with forestry looming largely in the programme drawn up for its expenditure, affords a dazzling prospect of lucrative forestry appointments becoming plentiful in the near future, and many young men, attracted by what Professor Stebbing justly describes as "an interesting and healthy profession," are doubtless turning their eyes in that direction. But do existing circumstances warrant the optimistic views of the Professor, or will they satisfy the prospective students he is so anxious to attract to the academic groves of Edinburgh? That State forestry can be developed in Britain no one doubts. But when the Development Commissioners themselves put "the training of foresters and organised research and demonstration" forward as necessary preliminaries to its initial stages, one wonders where their experience of the subject has been gained. The initial stages of forestry development in the United Kingdom are closely bound up with the purchase of suitable land in large blocks, and its subsequent conversion into forests by the erection of fences, housing accommodation for foresters, draining and preparation of the land, and the stocking of the ground with a few species, which

experience has shown are capable of growing to timber size in the British Isles. This work involves an intimate acquaintance with land tenure and values, and other questions connected with the general development of landed property, together with a long experience of British climate and soil, and their capabilities for growing timber, knowledge of which subjects cannot be obtained by two or three years' study at a university centre. On the other hand, men who have the necessary experience in all these branches of work are fairly plentiful, although they may not all be profes sional foresters, or members of the Development Commission. For the last twenty or thirty years landowners, agents and practical foresters have devoted a vast amount of time and attention to forestry development on private estates, Parliamentary Commissions and Committees have sat and reported upon the subject, and there exist more information and more men of experience than use could be found for in the most extensive scheme of State afforestation during the next twenty years. Apart from men trained entirely in the British Isles, many are available who have studied forestry in France and Germany, leaving out of account those Indian forest officers, who appear invariably eager to leave their work in India for the purpose of promoting British interests at home.

To declare that the training of men and the carrying out of research, (whatever that may mean,) are of primary importance in the initial stages of forestry development betrays an ignorance of the practical side of the question, which will assuredly lead to loss and disappointment in the future. Until some definite idea has been obtained of the area likely to be acquired for afforestation by means of the Development Grant, it is useless to encourage young men to take up forestry as a profession with the intention of obtaining employment on State property. Education should, of course, keep pace with the acquisition of land and its afforestation, but at the present time far too much importance is attached to a system of education which turns out men with plenty of theoretical but no practical knowledge, and unless the Development Grant is to be applied to the payment of salaries alone, it is difficult to see what

is to become of them, as they are totally unfitted to take charge of practical work until they have had several years' acquaintanceship with woods worked on commercial lines.

British forestry, such as it is, and very much as it ever will be has been an industry for the last hundred years, and it is little short of nonsense to state that no practical steps can be taken to extend and develop it until a number of raw youths have been passed through the mill of theoretical instruction—useful enough up to a certain point, but which cannot be turned to account unless supplemented by experience in the field of ordinary practice. The fact is that hindrances to forestry development are not a lack of men, or the absence of research, but a refusal on the part of the powers that be to recognise or admit facts concerning British forestry, which have been repeatedly proven on private estates during the last century and which any "research" that may be undertaken will simply and solely prove again.

I am, SIR,
Yours obedient servant,
PRACTICAL FORESTER.

September 26th, 1911.

NOTES.

Identification of Forest Specimens at Dehra Dun.—The Forest Botanist is now prepared to identify specimens on a limited scale. Previously this work was undertaken solely at Sibpur. Officers can now therefore send specimens to either Dehra or Sibpur. Specimens should include if possible leaves, flowers and fruit, and should be in duplicate, not more than ten however being sent in one consignment. The Forest Botanist would like it to be widely known that when specimens have been identified for a Forest Officer at Sibpur, he would be glad if the latter would send him duplicates for his herbarium.

Second International Congress of Entomology.—The second International Congress of Entomology will be held at Oxford from August 5th to 10th, 1912. Further particulars will be announced shortly.

The Executive Committee proposes to find for members of the Congress lodgings in the town, or rooms in one or more of the Colleges at a moderate charge ; rooms in College will be available only for men.

The Executive Committee invites an early provisional notice of intention to join the Congress, in order to be able to make the arrangements for the necessary accommodation.

The proceedings of the first Congress are in the press and will be published shortly.

All communications and enquiries should be addressed to the General Secretary of the Executive Committee :

MALCOLM BURR,

C/o THE ENTOMOLOGICAL SOCIETY OF LONDON,

11, *Chandos Street, Cavendish Sq., London, W.*

Training Centres for Rangers.—The Government of India have recently decided that it will be sufficient for present needs if three centres of instruction, *viz.*, at Dehra Dun, Coimbatore and Pyinmana, are provided, and have requested Provinces to utilise these. The suggested addition of a Ranger's class to the existing Balaghat Forest School will therefore not for the present be proceeded with, nor a suggestion made that the Punjab Forest Rangers be trained locally.

Forest College Athletic Sports and Prize-day.—The sports will be held at the end of March. Specially valuable prizes have been offered for competition, including a high grade English silver half-hunting watch and chain offered to the best all-round student by Sir R. W. Carlyle, K.C.S.I. and a valuable cup for the best all-round athlete offered by the Inspector-General of Forests. There will also be a cup offered for open competition in a half mile race. Here is a chance for old students who have kept themselves in good training.

Training for the Provincial Forest Service.—We see a statement in the *Pioneer* that the Secretary of State has sanctioned a scheme for training probationers for the Provincial Service at Dehra Dun. This no doubt refers to his approval having been accorded to a separate course of training for Provincial Service

direct candidates, extending over 2 years at the Research Institute, which the President has long been pressing for. We trust that this will be shortly inaugurated.

NOTICE TO SUBSCRIBERS AND OTHERS.

The Honorary Editor would be glad if subscribers and others would please note that all communications regarding change of address, non-receipt of copies, advertisement charges, payment of subscriptions, etc., etc., should be sent to the Manager, Pioneer Press, Allahabad, and not to the Honorary Editor. Disregard of this procedure entails delay, while in addition it unduly throws work on the editing staff.

Photo.-Mechl. Dept., Thomason College, Roorkee.

TEAK LOGS PLACED IN THE UPPER REACHES OF A FLOATING-STREAM WAITING FOR THE NEXT FLOODS—PYINMANA, UPPER BURMA.

VOLUME XXXVIII NUMBER 4.

INDIAN FORESTER

APRIL, 1912.

EXTRACTION OF TEAK TIMBER IN THE PYINMANA FOREST DIVISION, UPPER BURMA.

[*Contributed.*]

The following are some random notes made a few years ago on the subject of teak extraction in the Pyinmana Forest Division, Upper Burma. Much of the information was kindly supplied by the Assistants of the Bombay Burma Trading Corporation, Ld., to whose timber these notes refer.

The Pyinmana teak forests, it may be mentioned, are situated on hilly country with flats of varying extent, partly on the outskirts of the hills and partly along the main streams. These streams, together with their feeders, form a network of export lines down which logs are floated individually until they reach the Sittang river, where they are made into rafts and rafted down to Rangoon, crossing over on the way from the Sittang to the Pegu river (Pozaungdaung creek) *viâ* the Pegu canal.

Felling, which is carried out chiefly in the rains, is done with saw and axe combined

Logging is done with cross-cut saws. Axes are used only in exceptionally difficult places, where sawing would not be possible. The timber is logged in such a way as to give as much first-class

timber fit for the English market as possible : thus one English log and two bad logs are better than two medium logs and no English logs.

Dragging, which is done by elephants or buffaloes, is carried out in the rains and on to the end of the cold weather, as little as possible being done after the 15th March. The best season is the rains, the slippery state of the ground facilitating the work ; dragging is in many cases estimated to be three times as easy in the rains as it is at other seasons. To facilitate dragging it was formerly the custom to "snout" logs : this is not allowed now owing to the waste of timber involved, a slight trimming of the corner, to round off the sharpness, being found sufficient. Dragging is greatly facilitated by the construction of what might be termed "corduroy" dragging-paths (Bur. *dahlein-lan*). Billets of wood 4 to 6 inches in diameter are laid across the dragging-path, after the manner of railway sleepers, at distances of about $3\frac{1}{2}$ to 4 feet apart ; these billets are half sunk in the ground, and the logs slide over them with comparative ease.

Carting is substituted for dragging only if the distances are great, special timber carts (Bur. *gindeik*) being employed. Elephants being expensive, it is necessary to save them as much as possible by employing buffaloes for carting. If the distance is not more than 1 to $1\frac{1}{2}$ miles, dragging in the rains is usually found preferable to carting in the cold weather, the season when most of the carting is done.

Elephants can under present conditions of working, where the trees are scattered, drag from 40 to 125 logs from the stump to the floating-stream in a season. The elephants find their own feeding in the forest, and are not fed artificially until after February and then, only if they are working. The food they then receive is paddy.

Buffaloes as a rule drag smaller sized logs than elephants, but with the aid of the special corduroy dragging-paths described above large teak logs of as much as 4 tons are dragged by teams of 2 or 3 or even 4 pairs of buffaloes. The buffaloes are yoked together in pairs, the yokes being long poles 6 or 7 feet in

length. One pair pulls in front, the dragging-chain being fixed to a drag-hole (Bur. *napa*) cut in the top corner of the log. The dragging-chain is kept short, so that the buffaloes can slightly lift the front of the log. The rear pair of buffaloes, one on either side of the log, have their chain fastened either to another drag-hole at the rear top corner of the log, or to a wooden peg driven into the end of the log, at its centre. The intermediate pair or pairs, one animal of each pair on either side of the log, have their chains fixed to upright pegs driven tight into holes, 1 inch in diameter and about 3 inches deep, drilled into the log. In narrow places the rear pairs of buffaloes can be brought forward and harnessed in front of the leading pair. Buffaloes work best in the rains; they cannot stand hot dry weather, while on metalled roads their feet give out. Hence where carting is done they are employed only in the shade of the forest, the carts being taken over by bullocks where open country or metalled roads are reached.

Floating.—Where the floating-stream is very narrow the logs are placed in the direction of the stream; otherwise they may be placed in any position. Plate I shows a number of teak logs placed in the upper reaches of a floating-stream waiting for the floods of the next rains. The earliest rises usually occur in the middle of June; these, however, are not regular. September is the best floating month; August is generally not so good, there being frequent breaks in the rains. A rise of about 6 feet is sufficient to float the largest logs: anything above 12 feet is bad as the logs are apt to become stranded on the banks.

During the floating season gangs of elephants are kept in readiness along the streams waiting for rises, and as soon as these occur they go into the water and keep the logs in the stream, rolling or pushing them into the current whenever they show signs of standing. This work, known as *aunging*, is very necessary in order to prevent *taiks* or jams of logs, the removal of which, if they form, may be a difficult and dangerous operation.

Prevention of loss in transit.—During the cold weather, chiefly from December to February, elephants are sent down the streams

then nearly or totally dry, and logs stranded in the jungle and tall grass along the banks are searched for and rolled or pushed into the bed of the stream. This operation is technically known as "*aunging* drift," and timber left stranded in the streams after the floating season is over is known as "neaped timber." Plate II gives an idea of a typical floating-stream in December, with neaped logs lying in it. Fire-watchers patrol stretches of the streams in the dry season, to keep fire off the stranded logs. The chief danger of loss lies in the silting up of logs. These buried logs are sought for and dug up ; if they have been buried for any length of time they require to be left for two years to dry before they will float again.

Rafting in the Sittang river.—The logs are collected and formed into rafts at the mouths of the floating-streams, where these enter the Sittang river. In small streams like the Yeni a chain of floating teak logs, or a fixed boom of pyinkado posts, will stop the logs. In the larger and more powerful streams, like the Yônbin, booms are not employed, since even if the posts holding them are not torn up the banks become eaten away by the current : in such cases the logs are collected singly by swimmers or men in dugouts. The Sittang rafts require to be narrow, in order to pass through the Pegu canal lock gates : they contain 40 to 60 logs, as compared with about 120 logs in an Irrawaddy raft. Three men accompany each raft. The rafting season lasts from the beginning of September to the middle of November, there being insufficient water in the river at other seasons.

A SHORT PRELIMINARY NOTE ON THE SUITABILITY OF THE DEAD WOOD OF *ACACIA CATECHU* FOR KATHA-MAKING.

BY PURAN SINGH, F.C.S.

Under cover of his letter No. C.-1696 of 1910, the Conservator of Forests, Southern Circle, Madras, forwarded a report from the Range Officer, Coondapur, District Canara, on the unsuitability of dead tree of *Acacia Catechu* for Katha-making. The

Photo.-Mechl. Dept., Thomason College, Roorkee.

HEAPED TEAK LOGS IN A FLOATING-STREAM, PYINMANA, UPPER BURMA.

fact pointed out by the Ranger was worth a thorough enquiry. Accordingly, a sample of the wood from a dead tree of *Acacia Catechu* from Madras was received for examination. To see if the heart-wood of dead trees differed in any way from that of the living tree, two specimens of the heart-wood, one from a naturally dead tree and the other from a tree killed *in situ* by girdling were also examined. The following table embodies the results of the examination :—

Description of the sample.	Moisture, per cent.	Aqueous extract, per cent.	Alcoholic extract, per cent.	Catechu, per cent.
1. Heart-wood of dead tree from Madras ...	8·23	12·72	9·76	2·56
2. Heart-wood of dead tree from the Siwaliks ...	9·58	16·40	12·38	1·48
3. Heart-wood of a tree killed *in situ* by girdling from the Siwaliks ...	17·50	12·05	10·18	4·02

The percentage of catechin from the wood of both the trees which had died naturally, which had been standing for a considerable time in the forests, and which had therefore been exposed to climatic influences was very low ; their wood must therefore be pronounced as unsuitable for katha-making. The cause of it being unsuitable for the extraction of katha is not due to the death of the tree, but to the anhydration and oxidation after death. By a series of experiments I have arrived at the fact that if the heart-wood is kept for a prolonged period after felling, this has an injurious effect on it as far as its suitability for extracting catechin is concerned. A specimen that in 1907 had 10·9 per cent. of catechin, 13·7 per cent. of alcoholic extract and 21·8 per cent. of aqueous extract, showed in 1911 only about 8 per cent. alcoholic extract and about 8 per cent. of watery extract, catechin *nil*, and had most of the tannin oxidised into catechu-red. The wood had become useless as a katha or cutch-producing material. The tree killed *in situ*, in spite of its having been dead for some months, still showed white deposits of Keersal and gave

a fairly average composition, though it, too, had lost a small percentage of its catechu tannin.

The conclusion which I arrive at is, that it is not the actual death of the tree which makes the wood unsuitable for katha-making, but the effect of long exposure. Briefly speaking, the effect is one of anhydration and oxidation due to the "weathering" of the wood. Catechin first oxidises into catechu tannic acid which further is oxidised into catechu-red.

"PODOPHYLLUM EMODI."

BY PURAN SINGH, F.C.S., CHEMIST TO THE FOREST RESEARCH INSTITUTE.

Podophyllum is a small herbaceous plant belonging to the family *Berberidaccæ*. There are in all four species of this plant known. *P. peltatum* grows in North America. It is this species which is at present the chief source of the popular purgative podophyllin. *P. emodi* (Wall) grows in Northern India and also in Tibet and Afghanistan. This species has, comparatively speaking, only recently attracted the notice of the scientific world and its claims to be included in the British Pharmacopœia are now being considered. The other two species, namely, *P. pleianthum* (Hance) and *P. versipelle* (Hance), are met with in China. They are only of botanical interest. The Reporter on Economic Products first noticed this plant in Kulu, during a botanical trip there in November 1888. It was afterwards found in Garhwal, Kumaun, Chamba and the hills near Simla, Kashmir and Hazara. It is also met with in Sikkim, Tibet and Afghanistan. The plant grows less plentifully in the eastern part of the Himalayas than in the western and central parts of the range. It does not occur below an altitude of 6,000 feet and generally is only found at an elevation of 8,000 to 9,000 feet though sometimes up to 15,000 feet. Though the plant is met with in Garhwal, and north-west of Simla in the Shalai and other hills, it is most abundant in the western hills of Simla and in Kumaun, in Chamba and Kulu where the hill slopes are often practically covered with it.

DESCRIPTION AND HABITS.

As mentioned above, it is a herbaceous plant rarely attaining a greater height than one foot. The root system is perennial and it consists of one rhizome with numerous thin rootlets branching off from it. Above it is the succulent stem growing annually and bearing from one to five leaves according to the age of the plant. The plants generally appear in April and die down in November. The leaves usually appear when the stem has attained a height of 6″ to 12″, and hang umbrella-like on either side of it. It flowers in May and the flower is white with a pinkish tinge. The fruit ripens about August and September. It is of the size and shape of a small lemon. Attempts are being made to cultivate this plant and it has been observed that it can be grown from sections of the rhizome as well as from seed, but the former method generally takes a longer time than the latter. It grows two years after planting the sections but it is only after the fourth and fifth year that the rhizome is fit for collection.

ITS MEDICINAL PROPERTIES.

As in the American species the active principle is found only in the rhizome and rootlets branching off from it. The resin extracted from the rhizome is an hydragogue cathartic in large doses and an alterative in small. The activity of the resin depends on the chief active principle called *podophyllotoxin.* From its vernacular name *papra* or *papri,* also *bhavan bakra* or *bakara* which are given in the new *Pharmacographia Indica,* it is supposed that it was one of the bile expelling plants known to Sanskrit writers under the name *Paprati.* In Chamba and Kulu they are known as *Gulkakri* or *Bhavan kark* respectively. The similarity in names shows that the same property is attributed to it. In some places indeed it is used as a jalap. It is known to have a specific action on the liver causing an increased secretion from the bile. But unlike jalap, if taken by itself it causes severe griping and pain and is thus rarely used. In some cases it serves the same purpose as calomel.

ITS CONSTITUENTS AS COMPARED WITH THE AMERICAN SPECIES.

The Reporter on Economic Products, when he first noticed this plant in 1888, at once thought of having it chemically examined to determine if in its constituents and their medicinal properties it would compare favourably with the American species. Accordingly, he sent some roots to Dr. Dymock of Bombay for chemical examination who, in conjunction with Mr. Hooper, instituted a comparative examination of the two species and reported that the Indian species contains more than twice as much podophyllum resin as the American. According to Mr. Hooper, *P. emodi* contains 12 per cent of the resin whereas the other contains only 4 per cent, and both are similar in their physiological activity. In 1898 Professor Dunstan, together with Dr. Henry, made a complete investigation into the chemistry of both the species. *P. peltatum* had already been examined by many chemists, but it was Podwyssotski (Pharm. Journal, iii, 7, 12, 217, 1011) who made the first important contribution on the subject.* He proved that the resin did not contain any alkaloid such as berberine. He obtained three substances *Podophyllotoxin*, *Podophyllic acid* and *Podophylloquercetin*. He also showed that when *podophyllotoxin* is acted on by alkalies, it is converted into two new substances *Picropodophyllin* and *Picropodophyllic acid*, the former of which is crystalline and the latter gelatinous. Kursten amplified on this work and obtained *podophyllotoxin* in a crystalline form and believed that along with the isomeric *picropodophyllin* formed by the action of alkalies on *podophyllotoxin*, an oxidation product is formed which is gelatinous and is identical with Podowyssotski's *picro-podophyllic acid.*

Dunstan and Henry give the following constituents of *P. emodi* and prove that *P. peltatum* is identical with it in composition. According to them the crystalline *podophyllotoxin* has the composition $C_{15}H_{14}O_6\ 2H_2O$. When acted on by aqueous alkalies it is converted into its isomeric compound *picro-podophyllin.* It was also shown that both the above-mentioned isomers contained two methoxyl groups. They also isolated the podophyllic acid to

* See Imperial Institute Technical Reports and Scientific Papers, 1903.

which they assigned the formula C_{15} H_{16} O_7. The yellow colouring matter was also carefully separated and purified. It was shown to have the formula C_{15} H_{10} O_7 and to yield a pentacetyl derivative melting at 192°C. This substance is identical with *quercetin*. But even after *picropodophyllin* and *podophylloquercetin* has been removed a dark brown resin is left behind. It is amorphous and completely soluble in alcohol. This was also shown to be physiologically active though not so irritating as *podophyllotoxin* which cannot by itself be used as a medicine. To sum up *Podophyllum emodi* like *Podophyllum peltatum* contains the following substances:—(1) *Podophyllotoxin*, (2) *Podophyllic acid*, (3) *Podophylloquercetin* and (4) *Podophyllum resin*. *Picropodophyllin* is not a constituent of the herb but can be prepared from *podophyllotoxin* and is an isomer of it.

COMPARATIVE ESTIMATION OF PODOPHYLLUM RESIN AND PODOPHYLLOTOXIN IN TWO SPECIES.

Hooper and Dymock were the first to make a comparative estimation of the amount of resin in the two species. According to them the percentage was about 11 per cent in the Indian species and 4 to 5 per cent in the American one. Umney found the percentage to be 12 per cent in *Podophyllum emodi*. Dunstan and Henry found 9—12 per cent of resin in the Indian root and 4—5 per cent in the American. They also showed that the Indian drug contains 2—5 per cent of *Podophyllotoxin* while the American contains only ·8 to ·9 per cent. In regard to the variation in the resin per cent of the Indian roots, it may be mentioned that the writer had the opportunity to examine samples of *P. emodi* roots from different localities collected in the different seasons and he has shown (see Forest Bulletin No. 9) that the percentage of resin in the Indian roots varies from 10 to 20 and that of the toxin in the resin from 25 to 50 according to the locality and the season of collection, and it is safe to assert that an average sample of the Indian root will contain, as a rule, twice as much of the active principle as the American. It has also been determined that the best season for collection is May, when the herb is in flower. In

order to obtain the Indian drug of standard and regular composition, it is essential that it should be cultivated and collected under similar conditions in a systematic manner. It is gratifying to note that the Forest Department is looking into the experimental cultivation of this valuable drug.

Doctors Mackenzie and Dixon of St. Thomas Hospital have made a comparative investigation of the medicinal properties of these two herbs and proved that the resin from *P. emodi* is as good a purgative agent as that obtained from *P. peltatum* when administered in small quantities but acts more powerfully when given in large doses. The chief physiological and therapeutical properties of the various constituents of the herbs can very well be understood from the following statement of the authors :—

> "That Indian Podophyllin is an active purgative and a useful therapeutic agent; that it may be substituted for *P. peltatum*. But it is important that the physician should know which sample he is prescribing, as the Indian variety is nearly twice as physiologically effective as the American. That the active principles contained in the crude resin are two substances—(*a*) Crystalline *podophyllotoxin*; (*b*) *podophyllo-resin*,—both of which act as excellent laxatives in small doses, without secondary constipation or other objectionable symptoms."
>
> "That although both these substances act very similarly on the alimentary tract, it is only the podophyllo-resin which exerts a true cholagogue effect, which shows itself rather by a large increase of the solids secreted than by an increased quantity."
>
> "Both exert their specific activity when injected hypodermically in alcoholic solution, but in man so much irritation is produced as to forbid their employment in this manner."

It has been shown that the rhizome of *P. emodi* of India is twice as active as that of the American *P. peltatum*. They are identical in their chemical composition and in their physiological

and therapeutic properties. All scientific authorities are unanimous in their preference of *P. emodi* as a medicine to *P. peltatum*, though exception is taken in certain quarters as to the constancy of its composition. It has been pointed out that this difficulty can be overcome by artificial cultivation of the rhizome under uniform conditions.

It has been included in the Addenda of the British Pharmacopœia, but it has not yet got its due place in the B. P. official list, and because of this want of full recognition, it does not fetch at present a remunerative price. For example, a Calcutta exporter obtained only 34 shillings per cwt. c. i. f. London for rhizome containing 13 per cent of this resin. This rate is extremely low considering the superior quality of *Podophyllum emodi*. At this rate, it is hardly worth while to cultivate it or even to collect it. It may not be therefore out of place to draw the attention of the Committee appointed for the revision of the British Pharmacopœia to the claims of *Podophyllum emodi* for inclusion in the revised edition.

The price of the Podophyllin or the Podophyllum resin obtained from the American plant is about 9 shillings per lb. in London. The Indian rhizome contains about 11 per cent, and 1 cwt. of it would give about 12 lbs. of the resin worth 108 shillings. Once it becomes fully recognised by the B. P., it will be worth while to manufacture the Podophyllum resin in India and thus realise its full value instead of exporting the rhizome at 38 shillings per cwt. as at present.

THE REPORTER ON ECONOMIC PRODUCTS.

The following is the text of the Government of India resolution on the abolition of the post :—

From the 1st of February 1912 certain changes will be made in the duties of the Reporter on Economic Products to the Government of India and that officer will be transferred to the Botanical Survey of India with the title "Economic Botanist to the Botanical Survey." Communications such as have hitherto

been made to the Reporter on Economic Products on the subject of animal medicinal products, wool, leather, tea and cinchona should in future be addressed to the Director, Botanical Survey, Royal Botanic Garden, Sibpur, Calcutta. Similar communications in respect of forest matters should in future be made to the Director, Forest Research Institute, Dehra Dun ; in respect of agricultural matters to the Director, Agricultural Research Institute, Pusa ; and in respect of geological matters to the Director of the Geological Survey, Calcutta.

REVIEWS.

A RESEARCH ON THE PINES OF AUSTRALIA.

[By R. T. Baker, Curator and Economic Botanist, and H. G. Smith, Assistant Curator and Economic Chemist, of the Technological Museum, Sydney, published by authority of the Government of New South Wales, Sydney, 1910, as No. 16 Technical Education Series of the Department of Public Instruction. Price not stated.]

1. This is a handsome royal quarto volume of 458 pp. printed on heavy glazed paper and profusely illustrated with well over 300 figures, many of which however are not numbered. The work, the results of which are included in this volume, was undertaken with the object of ascertaining the extent of the commercial possibilities of the conifers of Australia. The plants dealt with comprise—*Callitris* (18 sp.), *Actinostrobus* (2 sp.), *Diselma* (1 sp.), *Microcachrys* (1 sp.), *Athrotaxis* (3 sp.), *Araucaria* (2 sp.), *Agathis* (2 sp.), *Dacrydium* (1 sp.), *Pherosphæra* (2 sp.), *Phyllocladus* (1 sp.), *Podocarpus* (5 sp.) and the word *Pines* in the title of the work consequently strikes one who is not familiar with the local vernacular names of the species as somewhat inappropriate.

2. So far as the information and materials available rendered possible, each species has been dealt with under the heads of habitat ; systematic description ; economics, anatomy, chemistry of products of leaves, fruits, timber and bark ; and forestry. The

authors were assisted in their work by the officers of the Department of Public Instruction and much of the information included regarding the distribution of the various species and other points was obtained from the Public School Teachers of the State. An appendix gives the names of no less than 250 correspondents (chiefly Public School Teachers) who assisted in collecting data for the work. In addition to the material obtained from New South Wales specimens were also obtained, to some extent, from other parts of Australia and the principal European herbaria were also consulted.

3. Among the more important species dealt with may be mentioned :—

Callitris glauca (White Pine) attaining a height of over 100′ with a diameter of 2′—3′. Yields a good building timber which, in company with that of other species of the genus, is but little attacked by white-ants, probably on account of a phenol contained in the wood to which it owes its characteristic odour.

Callitris calcarata (Black Pine) attains 60′—80′. Yields an ornamental and good building timber and also a valuable bark for tanning.

Araucaria Cunninghamii (Hoop Pine) attains 200′ and a girth of 22′—23′. Largely used for all kinds of indoor work.

Araucaria Bidwilli (Bunya Bunya) attains 150′ and yields a timber valuable for indoor work.

Agathis robusta (Queensland Kauri) attains 150′, and yields an excellent timber for joinery and commercial oil of turpentine.

Podocarpus elata (Brown Pine) attains a height of over 100′ and yields a valuable wood for joinery which is said to resist attacks of teredo and white-ants.

4. The authors have done excellent work in bringing prominently to notice the urgent necessity for an energetic and scientific forest policy in Australia which, while arranging for the prompt utilisation of the valuable species, would also insure a permanent and sufficient supply of the same. In the case of practically all the important species there is apparently the same sad story of destruction and want of provision for the future. Thus of the valuable Hoop Pine we read that "forty years ago the ridges

on the Lower Richmond were covered with what appeared to be an inexhaustible supply. A saw-mill to cut up the pine was started at Lismore about 1856 followed by several others at different parts of the river. * * As a natural consequence, at the present time, this pine is rapidly becoming a tree of the past on the Lower Richmond."

Of the White Pine that "they are getting scarce near the towns owing to the great demand for this timber, and the thoughtless destruction of young trees" and that "the supply of this most useful timber is gradually becoming less and less, and no steps are being taken for its propagation." Of the Brown Pine in New Italy we read that "this species is, unfortunately, almost extinct, the only specimens being saplings of very little value. It grew in profusion about the Williams River long ago."

Of the Kauri that "it has always been regarded as the most valuable of Queensland pines, but it is unfortunately becoming scarce," while the authors rightly note that "the present policy of indiscriminate destruction of Australian vegetation, now going on all round us, is to be deplored, and we raise our voices in protest; while, on the other hand, we would indeed welcome a vigorous policy in the opposite direction."

We are glad to see that in the authors' opinion successful afforestation depends on an ecological study of the species concerned "because it must certainly be more judicious and scientifically correct to plant those trees which are most suited by habit and constitution to the situation and soil required to be utilised, than to deal with the matter in a haphazard way."

5. The authors have brought together a large quantity of valuable economic information regarding the distribution of the various species, more particularly with reference to New South Wales, and the economic products yielded by them which include timber, perfumery oils, turpentine, tanning-material and sandarac. While we are in full sympathy with the contention that pure science forms the foundation on which applied science must be based, we cannot but feel that the present book would have better served its purpose of assisting "the development of the natural resources

of Australia," which the authors state has been their incentive throughout, if more care had been taken to give prominence to facts of obvious practical interest and importance and to prevent these being obscured by detail of purely scientific interest. Thus the ordinary reader naturally wishes in the first place to be able to identify the species with certainty which have been dealt with. He will however find no concise key, based on easily recognisable morphological characters, to help him in quickly discriminating closely related species, and although there is a profusion of figures illustrating the anatomical structure of several species, of others there are no figures at all. The business man, also, who is on the look out for information regarding the products of known, or probable, commercial value, and for facts which will help him to decide whether or not a paying industry can be established, will find himself impeded by much detail of purely botanical or chemical interest.

6. The key to the lines of work followed and method of publication adopted is apparently to be found in the authors' faith regarding the capacity of anatomy and chemistry to aid in systematic work, to help in the definition of species, and in indicating their relationships and their course of evolution. In our opinion the primary object of the systematist must be to define, and to assist field-workers to identify, plant-groups which actually occur as distinct and readily distinguishable entities in the field and the definition of the systematic species must therefore depend on morphology alone. In this work of definition the pioneer must be the herbarium systematist, but no species can be regarded as finally established until the work in the herbarium has been exhaustively tested in the field by the field systematist and ecologist. A species founded on morphological characters alone which has passed the test of both the herbarium and field-botanist must be considered as having been finally determined, and classification thus arrived at should not be influenced or upset by a consideration of different sets of characters, anatomical, chemical, or otherwise. Granting this, it will be at once conceded that anatomy and chemistry may both subserve a valuable if only

subordinate roll in systematic work inasmuch as they may be the means of drawing attention to morphological characters which had hitherto been overlooked and may provide additional characters which are always correlated with morphological differences, by the aid of which the accurate identification of incomplete specimens and of the products of plants may be facilitated or rendered possible, while the help of these branches of knowledge is of course indispensable if we wish to elucidate problems of plant-nutrition or to realise the full economic benefits to be derived from vegetation. The lack of a clear understanding of what is to be regarded as a species and of a clear recognition of the part which field-study and ecology must play in the final determination of species and in the accurate definition of the boundaries of plant-groups which the herbarium systematist can only indicate approximately and tentatively, we regard as desiderata of the first importance in modern botany. Until a general understanding is arrived at regarding them, it seems impossible to hope for a time when nomenclature and classification shall crystallise from their present state of flux, shall present for the use of the practical man and economic worker adequately defined and finally named plant-groups, in the place of elusive forms with ever-changing names and varying characters, and shall provide a firm foundation on which the problems of the relationship and evolution of the various forms can be undertaken with some prospect of success, rather by an experimental study of the variation and heredity of living plants than by a search for correlated characters and theorising on herbarium material.

7. This being our view we are naturally disappointed to find that the authors, who were apparently able to study their plants in their natural habitats, have not found it possible to pay more attention to ecology. The details given in the book, for instance, do not indicate that the field-study has been sufficient for an accurate or permanent definition and classification of the various species. The authors themselves point out that a wide geographical area by no means necessarily connotes considerable differences in environmental factors, and consequently a species which appears

constant from isolated gatherings in widely separated localities may prove to be variable and to present numerous intermediates, if care is taken to study it in localities where there is a considerable difference in such important factors as soil, available moisture, light, proximity of nearly related species, and so on. To discover and explore such localities and to deal satisfactorily with the intermediates that may be met with is the special function of the field-botanist and ecologist and until this work has been done the classification cannot be regarded as final. From the quotation with which the authors aptly close their book it is clear that they do not consider their work as finished and we trust that they will supplement the valuable work that they have already done on the Australian Eucalypts and Conifers by a careful ecological study of the species dealt with. When this has been completed, we would suggest the issue in handy form of a concise summary of the chief results obtained which would aim at (1) facilitating as far as possible the ready identification of all the species finally established, and (2) giving prominence to all facts of undoubted practical importance, those of purely scientific interest being omitted.

8. While therefore the book seems to us to be to some extent open to criticism, we must record our unstinted admiration for the industry and skill with which a mass of valuable information has been collected, which cannot fail to be of interest to the botanist, chemist, forester and commercial man and which makes the book indispensable to anyone interested in the forest vegetation of Australia.

A feature of the book which deserves special attention is the successful employment of natural-colour photography for the reproduction of stained micro-sections.

CORRESPONDENCE.

TO THE HONORARY EDITOR, INDIAN FORESTER.

SYLVICULTURE IN BURMA.

SIR,—In a letter published in the *Indian Forester* for December 1911, Mr. Troup states that "it has been recognised by many Burma officers, who have devoted attention to the matter, that the selection system as practised in the teak forests of Burma, whether with or without fire-protection, has not proved an unqualified success." As a matter of fact, the Conference expressed a unanimous opinion "that it was premature to assume that the selection system had failed." But whether or not he wishes to imply that the scheme was expressly prepared to meet the wishes of Burma officers, I must explain that to me personally the scheme came as a great surprise and I understood to others also. I was not aware that the question of introducing a more uniform system of working had been seriously discussed before his scheme was published, but certainly the subject has been very much more frequently discussed by Forest Officers among themselves since the Conference, and it would appear therefore that the few days' discussion at Maymyo has not exhausted the subject.

The scheme is an important one, and if applied to all teak forests of Burma, as appears probable, it will bring about a complete change in the aspect and character of our forests. It will cost a vast amount of money and will occupy a great proportion of the time of the staff. The value of discussion and criticism is generally recognised as is evidenced by the fact that it forms the basis of Parliamentary Government, and therefore, although Mr. Troup considers it a waste of time to re-open the question, I hold that the matter is of such importance that it can hardly be too fully discussed, and if, as stated by Mr. Troup, I am the only dissentient, I am on that account the more qualified for the post of "devil's advocate."

Mr. Troup has been somewhat free in accusing me of "gross inaccuracies" and "misrepresentations." His principal indictment is that I have misrepresented his ideas so far as to say that his "primary object in desiring a change of system is in order to introduce fire-protection." Under the heading "Objects sought to be attained" the first reason, and the one which distinguishes it from any working-plan yet prepared, is in his own words "to secure such advantages as may result from fire conservancy." Moreover in his memorandum Mr. Troup claimed that the measures advocated "would, it is thought, solve to some extent the vexed question of fire-protection." Again the first and therefore presumably the most important reason for the change is given in the following words :—

> "This change of system is justified from the fact that under the selection system—(1) The natural reproduction of teak is not as plentiful as it should be even in areas where improvement fellings have been carried out. It is often absent and under the present method of treatment the teak will disappear over large areas."

It is well known to every one that the absence of natural reproduction is due to fire-protection. That it is due to fire-protection only and not in any way the result of the selection system is proved by the recently published statistics which show that on an average in the selection worked forests of Burma the youngest age gradation comprises 61 per cent of the whole stock and that it contains more than 20 times the number in the gradation closest to maturity. It is quite true that the word fire-protection was not actually mentioned, but to any one who knows the fact a very clear reference is implied. It is obvious to any one who gives the matter the slightest consideration that under present circumstances if the principal object sought to be attained is to retain fire-protection, or rather seeing that there may be some subtle distinction which I cannot grasp, "to secure such advantages as may result from fire-conservancy the selection system must be abandoned and that the only practical solution is to make ourselves entirely independent of true natural reproduction and in fact to adopt the uniform system." But

on the other hand, if we aim at such a common-place object as a steadily increasing yield and surplus, the estimates and reasons I have given show, I think, that the aim could be attained more readily under the selection system.

In a review of Forest Administration in Burma, page 505, it was stated that we "have heard rightly or wrongly that a number of the resolutions passed at the Conference have been treated as of little present importance," and as little attention has been paid to the views generally held by the Burma officers on fire-protection, there seems to me a distinct danger that the views of the Conference on this question, as expressed in the amendments, may be entirely ignored, but that otherwise the scheme may be applied to all Burma forests on the ground that it gained the approval of the officers present.

As regards the other reasons for the change, it was stated that under the selection system "improvement fellings can be carried out only over a small fraction of the area over which they should be carried out." Seeing that under the present treatment improvement fellings are supposed to be, and generally are, carried out over a thirtieth of a working circle and that under the new scheme it is only intended to carry them out over $\frac{1}{150}$ of a working circle the reason seems without point.

Reasons 3 and 4 although not amended by the Conference are stultified by the expression of opinion by the Conference "that the uniform system would not show any advanced improvement on extraction of timber other than teak."

The last reason is discounted by the fact that adequate supervision of the fellings will not be materially improved until after 150 years.

Teak, however, does not reproduce itself naturally so as to give rise to a uniform crop, and in order to rearrange the distribution so that the same yield can be maintained from a felling series of 150 years, it will be essential to carry out works which will ensure that five trees will reach maturity simultaneously in place of one tree at intervals of 30 years. This will entail a considerable amount of energy. I do not pretend to be able to give any estimate and do

not even know whether the works prescribed will achieve the desired end. It is, however, generally supposed that the works required for bringing about the redistribution will simultaneously result in a greatly increased yield, but even if the greater part of the expenditure is debited to the cost of increasing the yield, it is evident that part of the expense should be debited to the cost of rearranging the fellings, and that this amount will be considerable. The question arises therefore whether the reasons given justify the cost, and I maintain that this depends mainly on whether or not it is sufficiently advantageous to secure the benefits of fire-protection.

As regards improvements in communications the opinion of the Conference to which I have referred appears to support my views that no very great economies could be effected by export works. As however the advantage of concentrating fellings is greatest in areas where the natural method of extraction is by road—and there are many such—and least where each log has to be dragged separately by elephants to the floating stream I still hold the view, possibly not expressed in the best of taste, that the teak forests of Burma are the least suited for the introduction of the uniform system into India.

As regards risk of anthrax, Mr. Troup has not, I think, grasped my difficulty. Although at present teak is very sparsely scattered, yet anthrax is fairly prevalent, but when the teak is concentrated—and I presume, he will aim at securing not less than 10,000 mature trees per square mile, each log of which will have to be dragged separately—a large number of elephants and cattle will be brought together and I do not understand how the most intelligent working-plans officer could avoid increasing the risk of anthrax. The coupes may be judiciously arranged but the danger would occur in the coupe itself.

As I pointed out it is at least conceivable that in long process of time the size of divisions may be reduced to about 25 square miles. It will therefore be necessary to make many and small felling series which will tend to prevent concentration of work in the present, or if only two or three felling series are prescribed then it will be difficult to avoid possible inconvenience in the dim

and distant future. Under the selection system, however, fellings and works of improvement can be concentrated into one large block without causing any subsequent difficulty however minutely division may be split up. In spite of Mr. Troup's reply therefore the advantage appears to be with the selection system.

Mr. Troup states that I "need have no apprehension for the future, as the permanency of the yield will be amply maintained." I could have wished for a definite statement of the results he expects to attain so that I could have formed an opinion on this point.

It is an axiom in forestry that no transformation of fellings can be carried out without sacrifice, and in his remarks on the proceedings of the Conference the Inspector-General of Forests pointed out that the refusal to make further sacrifices was a defect of the final scheme. The less sacrifice is made the less the forests will tend to become uniform and the retention of the existing stock of teak until maturity will cause large blanks which will presumably become filled with new growth. This will mature at a different period from the main crop and prevent absolute uniformity for a further rotation. This is, I understand, the view held by the Inspector-General and as such demands serious consideration.

In changing the system therefore Mr. Troup cannot have it both ways. He must either make sacrifices or accept the defects which the refusal to make sacrifices entails. It appears probable, however, that he does intend to sacrifice the whole or greater part of the stock of species other than teak to make way for a new even-aged and uniform crop so that in the 149th year little or no extraction of these species, many of which appear to be a great potential source of revenue, would be possible except in the remaining $\frac{1}{150}$ of the working circle. Mr. Troup also entirely ignores the remarks of the Inspector-General that the girdling limit should be lowered to three feet in girth. As I believe on no occasion has the Local Government ignored the advice of an Inspector-General, I maintain there is serious cause for apprehension. The effect would approximate very closely to the estimate given by me which showed the effect on the yield of a complete transformation within one

rotation. It would clearly render the areas brought under regeneration unproductive for several periods and seriously diminish the yield at a critical period because it would coincide with the time when the existing surplus had just been removed.

Apart from these objections, which are, however, I think not altogether negligible, I maintain that any sound scheme should aim at ensuring not only the maintenance of the present yield but also the gradual enhancement of the yield and surplus revenue, and so far as I can judge Mr. Troup's scheme does not comply with these conditions. Little or no work appears to have been prescribed to enhance the yield during the first 150 years, and as I anticipate that the yield will diminish owing to the removal of the surplus, I fail to see how he can maintain the present yield. He is concentrating his attention on enhancing the yield and improving the facility of exploitation at the end of 150 years. The effect will apparently be sudden and is calculated to dislocate the market. Moreover he increases the yield at a time when there is not much apprehension concerning the yield. There is such a large preponderance of young growth in any normal forest that under any scheme a large proportion could be saved. It appears also probable that bamboos will be extracted on a large scale from the Tharrawady Division for paper-pulp. This will inevitably benefit the young growth enormously and apart from any work we may do will ensure a very much greater yield 150 years hence. So far as I can judge the yield under his scheme will remain practically stationary for the first 150 years, but it is reasonable to suppose that expenditure will steadily increase—work for instance will be necessary to tend the new crop induced by the methods proposed—and therefore I maintain that during the first 150 years the result will be a steadily decreasing surplus. Mr. Troup has ignored these objections but they are, I think, sufficient to condemn his scheme entirely.

It appeared to me that the scheme appealed to the Conference mainly on the grounds that improvement fellings as hitherto carried out have been less effective than they should be. The general impression seemed to be that to do lasting good it was

necessary to go over an area several times at frequent intervals, and therefore that it was preferable to go over a small area and to do the work really well than over a large area badly. If I agreed with Mr. Rodger in dissenting from this view, I may claim that I have given this point special consideration and believe that had the matter been more fully discussed it would have been admitted that our view is based on sound reasons.

In the discussion on fire-protection I laid stress on the fact that in these forests the balance is so delicately adjusted that a trifle is sufficient to turn the scale either way. The difference in the degree of shade inside and outside fire-protected areas is barely appreciable to the eye, and yet it is admitted that the effect on the stock of the light demanding teak is enormous. I would suggest however that the same fact applies with equal force in the case of improvement fellings. Each teak tree freed from suppression likely to cause its death in the immediate future is a pure gain, and the advantage is doubled by the fact that it involves a loss to its competitors, and as a great amount of such work can be done even by the least intelligent subordinate, I maintain that improvement fellings, even lightly and badly carried out, are of enormous benfit to teak in its struggle with other species. As is proved by the fact that in suitable areas teak is fairly plentiful, this species is clearly very capable of holding its own, but on theoretic grounds I am led to expect that the difficulty and expense would increase the greater the proportion it was attempted to save, and in actual practice I have invariably found that a small proportion are so unfavourably situated as barely to justify the removal of the growth causing suppression. To use imaginary figures I have found that if on an area it would cost Rs. 100 to free 50 per cent of the immature stock, it would cost Rs. 200 to free 75 per cent and Rs. 500 to free the full 100 per cent.

Our output of work is severely limited and we cannot attempt to do all the work we recognise would be useful. Instead therefore of attempting to free every teak over a small area I hold that we should obtain better value for our money by spending our Rs. 500 in assisting 50 per cent of the immature teak over an area

five times the size. The result of teak saved compares as 100 to 250. This is the reason why I think it preferable to go over a large area lightly than to do the work really well over a small area.

Immature teak may be divided into two classes—those which have penetrated the bamboo canopy and those which are in danger of suppression both by bamboos and inferior species of trees, and of these the former are in my opinion infinitely the more important. They represent the survivals of an infinitely greater number of seedlings and for sentimental reasons having got so far I think they should be assisted to the end to achieve the more glorious fate of death by the axe; and for sordid mercenary reasons because their present worth is higher and because they would come into their yield at a time when an enhanced yield will be difficult to attain and very valuable. The cover in the overwood is thin—statistics show that the average number of trees of all kinds over 3 feet in girth is under 20 to the acre—and therefore the cost of freeing these trees would be infinitely smaller than in the case of seedlings suppressed both by bamboos and inferior species of trees, and therefore by concentrating attention to these trees a very much larger area could be gone over.

The proposal to repeat the operation at frequent intervals was obviously based on the requirements of small seedlings which it is found are liable to be suppressed again by the irrepressible bamboo within about six years. I need not repeat the reasons why I think there is little apprehension with regard to the yield at the time when these seedlings will come into the yield, but I do not wish it to be supposed that I would do nothing for this class. However much we may differ in theory yet in practice when we carry out improvement fellings at 8 annas an acre we find it possible to free a great many of these seedlings. Assuming that it takes about 50 years for a seedling to penetrate the bamboo canopy and admitting that hitherto a proportion has survived through this critical period without any assistance, it is obvious that improvement fellings even as hitherto carried out would benefit this class very greatly especially if the work could be repeated at intervals of ten years.

Although my method of arriving at an estimate of the natural mortality that occurs in an ordinary teak forest may be questioned, yet there can be no doubt that it is very great indeed, and that it is avoidable. The only difference of opinion that can arise is whether it is practicable to carry out the necessary measures. The Prome and Toungoo Divisions may, I think, be cited as typical examples of long established divisions, where work other than improvement fellings is heavy. In both improvement fellings are carried out on a rotation of 30 years and if fire-protection which locks up a great amount of energy were abandoned, and when these divisions are split up as they will be almost immediately, is it reasonable to doubt that the rotation could be shortened to ten years? In other divisions the work may not yet have become in such good running order, but improvement in this respect seems merely a question of time and it is surely better to have too high than too low an ideal to work up to.

I may perhaps be permitted to offer a word of explanation with regard to my "great bugbear" fire-protection. I invited Mr. Troup to give a clear idea of what he considered the benefits of fire-protection, and referred him to a letter in the *Indian Forester* to show him that the doubtful point was whether fire-protection paid at Rs. 40 per square mile. He evaded the question, and notwithstanding the fact that I have published an estimate, he merely states in reply that I apparently doubt whether there can possibly be *any* benefit from fire-protection. Mr. Rodger published statistics showing the damage caused by fire in certain typical forests. Of trees girdled he found that 8 per cent were sufficiently injured by fire to affect their commercial value, 52 per cent were marked or scarred by fire and the remainder were uninjured in any way. Most of us have had ample opportunity and experience to decide whether or not these statistics are reasonable. They have never been disputed, and it is I believe generally admitted that they give a very fair average of the damage caused.

With these statistics it is a simple matter to calculate the value of the damage done to the whole crop in any given period.

The statistics show the accumulated injury to the trees in the final yield incurred during the life of these trees, a period of not less than 165 years, and this amount is equal to the injury caused to the whole growing stock during the period in exactly the same way that the accumulated volume of the trees in the periodic yield is calculated to be equal to the increment of the whole growing stock during the period. The loss works out in no case to more than Rs. 10 per square mile, but even this estimate is too high for two reasons. In the first place the trees in the final yield must have passed through at least one general flowering of bamboo, and as the bamboos when cut cover the ground to a depth of about six feet, it is probable that greater injury occurred at the time of the flowering than during the annual burning of the two or three inches of dead leaves against which only we are protecting our forests. In the second place the yield of the first period includes a large number of over-mature trees which are specially liable to injury, and as these are being removed the percentage of trees injured will be reduced in subsequent periods. On the other hand some allowance should be made for trees entirely destroyed by fire before attaining maturity. However, the main point is that it is impossible to dispute the fact that even excluding the cost of staff, etc., fire-protection does not pay, and under these circumstances it is a quibble to talk of benefits.

Lest it be thought that I hold extreme views I would draw attention to a motion passed by the Conference by a large majority "that fire-protection in plantations is ordinarily unnecessary after 10 years." I have always been ready to admit that the small value of the benefits was due to the small number of teak trees per square mile, and that when the struggle for existence had been brought under control and the stock of teak had been increased to a sufficient extent, the question might perhaps have to be reconsidered. In the case of plantations, however, the question of indirect injury by stimulating the growth of other species does not arise, and at the same time the number of trees is greater than in ordinary forest. This motion therefore shows the *general* opinion of the benefits of fire-protection under the most favourable circumstances.

Can Mr. Troup or can anyone deny that the cost of fire-protection is justified by the damage done by fire or that the indirect injury caused by fire-protection must, if continued, result in the total disappearance of natural teak? Yet if this is admitted—and it is undoubtedly the opinion generally held in Burma—could there be a graver condemnation of any sylvicultural work? When these facts were established in 1904-1905 the only possible conclusion to be drawn was that the work should be discontinued immediately, yet even now seven years later it still constitutes our principal work and occupies more of our time and funds than all other sylvicultural works combined. Is it a healthy state for any department to be in, that far and away the most important work should be one which the majority consider not only practically useless, but calculated to ruin the forests of which they have charge? I have no difficulty in justifying the importance which I attach to this question, but rather have difficulty in understanding the apparent indifference of those who holding similar view will not incur the risk of possible rebuff in pressing strenuously for the abolition of this work. Was it creditable that it should have been left to a youngster of only two or three years' service to raise the question in the first place, and is it right that I should be left almost alone to urge that "posterity will have good cause to blame us if this state of affairs is allowed to continue?"

Personally I regard the abolition of fire-protection merely as a means to an end. Lord Curzon in his farewell speech at the Byculla Club insisted that "there must be a policy instead of no policy" and defined a sound policy as "a method of treating the subject in question which is based upon accepted premises either of reasoning or experience." My view is that in a natural forest, such as a teak forest in Burma, the mortality is enormous. So far as I am aware this view is not disputed by anyone, and I maintain therefore that the soundest policy to adopt is to direct all our energies and funds to reducing this mortality by the obvious method of carrying out improvement fellings over the whole forest on as short a rotation as possible. When I joined my appointment it was the practice

to make a large number of teak plantations which caused annually a considerable amount of work and this work also I subjected to criticism, but when this work was discontinued and we were only required to maintain existing plantations, it appeared to me that fire-protection remained the only obstacle to carrying out an adequate scheme of improvement fellings, in that this work fully occupied our time and energies during the greater part of the working season.

I do not put forward any claim to originality for my views. It is well known that everyone recognises the usefulness of improvement fellings; the step taken to discontinue the formation of plantations met with general approval on the ground that it left us more time to devote to this work; the abolition of fire-protection appeared to be merely a matter of time and to be generally desired. Every indication therefore seemed to show that opinion was tending in the direction I desired. It therefore came as a shock to me that at the Conference a representative collection of Forest Officers should express a preference for works which will make it equally impossible to cope with the enormous natural mortality and which to my mind are only less objectionable in that, unlike fire-protection, they will not increase this mortality.

Mortality is not concentrated but goes on from year to year throughout our forests and no one can suppose that it will be possible to reduce it to any extent when we only attempt to go over our forest on a rotation of 150 years.

True natural reproduction of teak is sporadic and no one can suppose that it will be possible to bring about any resemblance to a uniform system without very intense and artificial works which will leave us no time to spare for other works.

It would appear therefore that I am alone in thinking that it would be practicable and desirable to combat effectively the enormous waste and destruction which goes on in our forests from year to year, but the fact that Mr. Troup's proposals were in the main considered desirable and were approved by the Conference has made me realise that at least in my time no such measures will be attempted. The retention of fire-protection may have been

forced upon us in spite of our wishes and experience but the approval of Mr. Troup's scheme must be taken to represent the mature opinions and judgment of Burma officers and means the absolute defeat of aims for which I have striven throughout my service, and if I have made an effort to retrieve the situation and have protested either at too great length or too strenuously, I think it should be borne in mind that this has been a bitter disappointment.

H. C. WALKER.

AKYAB :
30*th December* 1911.

THE EXPENDITURE ON FORESTS IN INDIA AND ITS RELATION TO THE REVENUE REALISED.

SIR,—The article in the January number of the *Indian Forester* under the above title deals with an interesting proposition of Indian Forest policy, and introduces a question of greater importance than might be surmised from the amount of study devoted to it. One conclusion, however, arrived at by the contributor, though accepted even by a number of Indian Forest Officers, is not in accordance with the elementary principles of economics. I refer to (ii) the proof of "satisfactory management from a commercial point of view" lying in "the net revenue realised per unit of forest concerned." There are also certain other inferences drawn in the article with which it is difficult to agree and to which I wish to draw attention.

Forest Officers generally, I think, will agree with your contributor that the margin of utility of working capital has rarely if anywhere been reached in the case of Indian forests, but it seems a pity in referring to over capitalisation and "conservative" management that he did not point out that there is at least a suspicion that the reverse may be the case as regards the invested capital, consisting, as it does, largely of growing stock. This danger is inseparable from the "conservative" management which is defined as keeping intact the capital provided and bringing to

its highest point the interest earned on it ; for it must be remembered the greater part of the capital provided in India is a natural provision, the adequate or excessive extent of which has barely been inquired into even in the most intensively worked forests. The rotations, on which the capital employed so largely depends, have of necessity been as a rule arbitrarily fixed, and the chief recommendation of the methods of treatment employed is usually their simplicity. Yet there seems to be a tendency to seek greater returns rather in more extensive than intensive working ; this is evidenced in the article by reference to scope for more extended working both in Burma and Assam. If then, as your contributor assumes, it is admitted that in no province the law of diminishing return is operative so far as working capital is concerned, surely it is right first to inquire where more intensive and where more extensive working should be the policy of the Forest Department. That either must involve increased expenditure there can be no doubt, the question is rather one of how a given expenditure can best be applied.

Figures given in the article show a great increase in revenue from minor forest produce in 10 years, and an increase of 31 per cent in the quantity of timber extracted, but an increase of only 9 per cent in the quantity of timber extracted per square mile. This not only indicates more extensive working, but shows clearly that a rise in prices is not responsible for increased revenue except in so far as this may have created a market for inferior qualities of material. As regards forest education, it is true it is necessary even for the extension of working, but it is even more necessary to enable more intensive working. Research work is quoted as being necessary in order to discover fresh sources of revenue ; this may be one branch of it, but quite as important, if not more so, are investigations which may enable the forest to be treated by the best possible methods.

Perhaps, however, the most interesting figures given are those showing that in the past 20 years an increase of 50 per cent on establishment charges has resulted in 38 per cent increase in net revenue. The result fully justifies the expenditure and clearly

shows the operation of the law of diminishing return which is probably due to closer approach to the margin of extensive forest cultivation. Indeed in justifying the increase your contributor drew attention only to more extensive working though he admits the almost general necessity for more intensive working.

The margin of forest cultivation, whether as regards extent or intensity, having not yet nearly been reached in India, it is natural that revenue and surplus have generally increased with increased expenditure, but still this does not prove that revenue and surplus might not have risen still further if in some cases the labour and working capital available had been applied to more intensive rather than extensive working.

It is not to be disputed that the "financial position" (success) is not reflected by the percentage of expenditure to gross revenue, though this in itself is no argument for more extensive working. The relation of revenue to expenditure must become more unfavourable the nearer the margin of cultivation is approached. This limit it is true may be extended, for instance by a justifiable provision of new means of communication, but a margin of extensive cultivation is likely to exist for many decades in Indian forestry, and with a given quantity of labour and working capital I question whether it should be sought to work right up to this margin rather than to work more valuable forests with greater intensity.

In spite of his arguments the author of the article subsequently refers to the relation of forest expenditure to gross revenue in certain European countries and seeks explanation of the low percentage. Comparison with India is clearly out of the question when it is recollected that few, if any, forests in those countries are now near the margin of cultivation either on account of their situation or quality of yield.

It is then asserted by the contributor of the article that it is apparent the "financial position" of forest administration "in any province can only be judged by the net revenue realised per unit of forests."

In his conclusions he substitutes "satisfactory management, from a commercial point of view for "financial position," and since

the latter term is somewhat vague I think I may substitute "financial success" in the above quoted assertion. It is then this assertion that net revenue is a measure of financial success that I wish to refute. I need only employ the arguments used by the writer of the article in showing that the percentage of expenditure to gross revenue is no suitable basis of comparison. The value of the yield of the forests and the cost of extraction affect as much the net revenue as the relation of expenditure to gross revenue, indeed the former argument is admitted by your contributor to apply to the case of net revenue of some provinces.

Again the case cited of forests overworked in former times—it is stated that money spent in bringing these into proper bearing will give no immediate return but pay a hundredfold in the future. Though the rate of ultimate payment suggested may be doubted, the expenditure will reduce the net revenue temporarily and yet the success of administration, whether financial or otherwise, may be all that could be desired in the circumstances. Finally, net revenue is considerably affected by such expenditure as on settlements, surveys and demarcation, which your contributor rightly observes is rather of the nature of invested capital not directly producing revenue.

Profit alone is the proper measure of economic employment of the elements of production, and profit takes account of the capital employed.

At the present day in India it may be difficult to gauge the capital employed in forestry, but some attempt might be made in the case of a number of the more valuable forests and in doing so account would be taken not only of the value of individual species, but of means of communication with the market; and then perhaps provinces such as the North-Western Frontier Province and United Provinces could better be judged in comparison with others than by considering net revenue per unit of area, relation of expenditure to gross revenue, or expenditure alone whether low or high. Not only this but the results would indicate where more intensive working would be profitable and where the opening up of new communications for more extensive working.

If the Forest Department is a semi-commercial department it behoves its members to adopt commercial principles where more important considerations do not exist, and not to be content with pioneer work only.

To summarise, while agreeing generally with the contributor of the article in his conclusions (i), (iii), (iv), and (v), though a low percentage of forest expenditure to gross revenue can be no proof of more satisfactory management in any country, not only India, except when comparing areas in which other things are equal, his conclusion (ii) seems to me a fallacy ; to repeat his words—

> "That the most satisfactory management from a commercial point of view must be judged by the net revenue realised per unit of forest, and that the best results in the present condition of Indian forestry cannot be realised without a high percentage of expenditure to revenue and a high expenditure per square mile."

A. D. BLASCHECK, F.C.H., OEC. D.,
Deputy Conservator of Forests.

PROBATIONARY SERVICE OF EXTRA ASSISTANT CONSERVATORS OF FORESTS PROMOTED FROM THE SUBORDINATE FOREST SERVICE TO COUNT FOR INCREMENTS UNDER THE TIME-SCALE OF PAY.

We are permitted to publish the following extract from a Government of India order on the above subject :—

"The intention was that the probationary service of an Extra Assistant Conservator of Forests promoted from the Subordinate Forest Service, but not that of an officer appointed direct, should be treated as qualifying for increments under the time-scale of pay sanctioned for the Provincial Forest Service and to state that the Government of India are pleased to rule that an officer promoted from the Subordinate Forest Service to the Provincial Forest Service shall count all periods, whether continuous or broken, of probationary service as Extra Assistant Conservator of Forests towards increments under the time-scale of pay."

SUBSTITUTE FOR HARD RUBBER &c.

His Majesty's Consul at Philadelphia (Mr. W. Powell) has furnished a report on a *new material*, manufactured by a secret process and stated to be a *substitute for hard rubber*, *cork*, *horn*, etc. The manufacture is claimed to be simple and cheap. The material is stated to be made mostly of bye-products or waste substances, indeed of anything that contains vegetable fibre, such as horse-dung, cow-dung, waste paper, hay or straw that is unsuitable for fodder, shavings, etc. It is claimed that the material can be turned out with a profit at $4\frac{1}{2}d.$ per lb. Exhaustive tests made in the United States show,it is stated, that electrically it is equal, if not superior, to hard rubber, fibre, porcelain, cork, horn, etc., and would take the place of these materials in several of their uses. Its power of resisting heat is said to be almost if not quite equal to that of asbestos, and it is extremely tough and very difficult to break. In its first stages of manufacture, being perfectly plastic, it can be moulded into any shape desired.—[*The Indian Trades Journal.*]

THE FALLING OF FRUIT FROM THE TREE AND ITS CAUSES

The conditions which bring about the falling of almonds and apples, apart from windfalls and the effect of insects, is worth the careful consideration of fruit growers. A good deal of loss is caused by these fruits falling when about the size of a hazelnut. Scientists attribute the occurrence to one of two causes, *viz.*, to incomplete fertilisation, or to insufficient nourishment, or both.

Professors Muller and Osterwalder have been engaged in studying and testing the truth of these suppositions in one of the experimental stations of Germany. The former confined himself to the almond tree. Of the fruit which fell on the ground 10 per cent were found without seed and only contained traces of germination ; 30 per cent contained only one seed and 9 per cent contained shrivelled embryos. Whereas, on the contrary, the fruit which remained on the tree had many seeds and though one of them contained only one seed, not a single fruit was found

entirely seedless. The investigation was regarded as proving that the falling was due to imperfect, or total absence of fertilisation.

In 1906 Prof. Osterwalder extended his researches to eight varieties of almond trees and to four varieties of apple trees. The fruit was collected either by gently shaking the boughs (dislodging the ripened fruit) or by picking. All the fruit so obtained was found to be fertilised and no material difference was observed in the number of the seeds contained in each of these groups. The alternative assumption, *viz.*, insufficient nourishment, was held in this case to have been the cause of any premature falling that might occur.

The treatment to be applied depends upon which of these two causes is at work. To ascertain this, cut the fruit across and examine the two halves. If there is no seed or if it is imperfect it may be assumed that fertilisation has been defective, owing, probably to the absence of pollen of that variety. To remedy this, blossom-bearing trees should be planted near. On the other hand, if one or more seeds are contained in each fruit, it may be taken as a sign that although fertilisation is satisfactory nourishment has been lacking and in this case manure, either khan or chemical, should be worked into the soil.—[*Cyprus Journal.*]

INSTINCT IN ANIMALS.

Herbivorous animals evince an almost unerring instinct in avoiding poisonous plants, even those which, to the human palate, would fail to betray their noxious properties. Monkeys may nibble at an unknown fruit, but they generally pause to study the result of that test, and nearly always manage to arrive at a correct conclusion.

Such facts suggest a sagacity which seems to indicate the existence of a "sixth sense." The ordinary senses of our fellow-creatures, says the *Philadelphia Record*, may receive warnings from indications which we have not yet learned, or else have forgotten to heed. The Superintendent of the Meteorological Observatory at San Salvador noticed with surprise that both the beasts

and the agricultural Indians of the neighbouring mountains seemed to recognise the omens of an earthquake which he himself would have been unable to predict without the aid of his barometer.

"There will be a temblorito (a little shock) before long," the Indians would remark, in the matter-of-fact way with which a person might comment on the probability of a rain shower. "What makes you think so?" he would ask the prophets. "Is there anything unusual about the weather or the looks of the sky?" "Don't know," was the invariable reply, "but I have felt that way before every earthquake."

The weather, at such times, might appear clear and calm; perhaps even cooler than usual; but soon after sunset the predicted temblorito would rattle along the streets, and shake the loose rocks from the cliffs of a neighbouring quarry.

In the reign of the Emperor Justinian, the coasts of Western Asia were visited by a series of destructive earthquakes, and a few days before the first shock the citizens of Antioch are said to have received a warning of its coming in the sudden departure of a large flock of rooks that had long made their nests in the city walls. The credibility of that seeming miracle has often been questioned; but is it not possible that experience may have taught the birds to connect certain conditions of the atmosphere with the idea of an impending 'quake?

Capenter mentions the case of a wren that built her nest in the slate quarries of Penrhyn in a situation liable to great disturbance from the occasional explosions. She soon learned, however, to take warning by the sound of the bell, which was rung to give notice to the workmen whenever a blast was about to be fired, and would quit her nest and fly to a little distance, where she would remain until the shock of the explosion had passed off.

Storms, too, are thus evidently anticipated by various species of animals and birds, and it is by no means inconceivable that even their supposed ability to forecast the approach of mild or severe winters may be in some measure a fact.—[*Indian Field.*]

CURIOSITIES IN FRENCH FISHING TACKLE.

French manufacturers of fishing tackle offer their customers a great variety of novel and ingenious implements: some of the devices are so curious, that a short description may interest angling readers of the *Indian Field.*

A cross-bow specially made for harpooning fish, appears to be a most ingenious toy, from which one might get a good deal of amusement. It has a wooden bow, which, however, does not bend as in ordinary cross-bows; the impulse to the harpoon is given by thick elastic strings. The arrow is a light tube made of fibre, with a steel head. The line runs down this tube to a reel, which is fixed underneath the barrel of the cross-bow. The makers declare that this instrument shoots with considerable accuracy, and that with its assistance one can capture fish of considerable size, when they are lying on or near the surface.

A terrible looking instrument in the harpoon-gaff; a set of claws gape at the end of the shaft, and on thrusting the contrivance down on to a fish the claws seize hold of it like the talons of an osprey. A French tackle shop offers, as might be imagined, a great assortment of fishing creels, for most of the baskets sold in England are of French make. Consultation of a Saint Etienne catalogue also shows that English sellers make an enormous profit on these foreign creels.

There seems to be a considerable demand among Continental anglers for artificial insects, judging by the numberless ingenious imitations which are offered for sale. Besides caterpillars, spiders, grasshoppers, beetles, and so forth, they make artificial gooseberies and cherries. You can also buy imitation mice and crabs, and frogs which work their legs in life-like manner, as they are drawn through the water.

An extraordinary fishing instrument is the floating reel. A reel is fastened to the top of a sort of little boat, while the angler carries a larger winder full of line. The boat can be made to sail out into the middle of a river, and let out the baited hook from its reel. The apparatus is, of course, an application of the otter principle, and

anyone using such a device on British waters would certainly be run in for poaching.

A peculiarly ingenious device of very questionable utility, is a combined rod and reel. The rod is in four pieces ; the top and two middle joints being of split cane, while the butt is a metal tube. On the butt are two grips, with a reel, permanently attached to the rod, between them. The upper grip glides backwards and forwards like the fore-end of a Winchester repeating shotgun. This to and fro motion winds in the reel, so that when you want to shorten line, you pump the upper grip to and fro. The paying out of line is regulated by a small lever worked by the thumb.

There is also an automatic reel made in France, which strikes the fish on touching a lever, or, if preferred, when bottom fishing, the reel can be arranged to strike the fish directly there is a pull at the bait. As the catalogue says, the angler, after resting his rod over a twig, can go off and smoke his pipe quietly, or take a siesta, and the reel does the rest.

For casting long distances, a reel is made to twist through a right angle, like the well-known Malloch. The French edition is, however, made in wood instead of metal, and looks very like an ordinary Nottingham wooden reel. The handles being fixed to the drum, the latter cannot be reversed, as in the case of the Scotch reel.

A very good system of stiffening light cane bottom rods is carried out in France. A fine silk ribbon is wound spirally round the cane, and then a similar ribbon is wound with the spirals in the opposite direction, both ribbons being varnished and covered at their ends by the ferrules they cannot ever become loose. This plan adds great stiffness and strength to light roach canes, without appreciably increasing their weight.

French tackle shops sell an enormous variety of made-up baits. Some of these pastes are scented with all kinds of odorous substances. One can even buy desiccated blood for bottom fishing.—[*"Fleur de Lys" in the Indian Field.*]

NOTES.

Vol. I, "Indian Forester."—This is missing in the set belonging to the Honorary Editor. If any one is willing to present this to him in order to complete the set or to sell it, the Honorary Editor would be very glad to receive it.

Final Examinations at the Forest College, Dehra Dun.—These were held during March. The list of students, who were successful in gaining certificates, we hope to publish in our next issue.

Bamboo Pulp.—Two interesting monographs are in course of publication by the Forest Economist and the Paper Pulp Expert now engaged at Dehra Dun, respectively, setting forth the prospects of the manufacture of paper from bamboo pulp. The process advocated by Mr. Raitt, the pulp expert, contains proposals which have stood the test of laboratory experiment with a high degree of success, and we believe that Paper Mills will find it to their advantage to examine Mr. Raitt's proposals very carefully and test them on a commercial scale. Mr. Raitt has just completed an examination into four or five of the principal grasses, the result of which it is intended to publish.

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THE NEED OF FIRE-PROTECTION IN THE TROPICS.

INTRODUCTION.

The present paper has been inspired by the great diversity in opinion that seems to exist among Forest Officers regarding fire-protection in the tropics. The views of the growing " too much fire-protection " school of Burma have been freely expressed and it seems time that a comprehensive review of all that has been written on the subject should be compiled. The present writer has endeavoured to collate these detached papers, not only from the pages of the *Indian Forester* but from all other publications in which he could find any statements bearing on the question.

As far as could be ascertained, nowhere outside the Indian Empire has the harmfulness of forest fires been questioned.

The present paper purports to quote, first, a few extracts showing the value of fire-protection in India, then at considerable length the arguments on which the opposite theory is founded, and then to discuss the evidence *pro* and *con*, closing with suggestions for general conclusions.

The writer has endeavoured to confine himself mainly to quoting what others have written, and for this reason offers no apology for somewhat lengthy extracts.

Before proceeding to the subject matter it will not be unprofitable to trace out the earliest record of protest against fire-protection. It is supposed by some that Mr. Walker first raised the question from Burma, but Mr. Slade, also a Burma officer, wrote to the same effect much earlier—1896.

But earlier still we find in the pages of the *Indian Forester* contributions from the pens of Mr. Porter from the Madras Presidency in 1894,* and Mr. Dickinson from Coorg in 1883,† both complaining of the absence of teak seedlings in fire-protected forests.

Even before these officers, however, as pointed out by the late Mr. W. E. D'Arcy‡, Captain Forsyth, in his "Highlands of Central India," argued that fires were beneficial to teak forests and assisted reproduction, and that by keeping out fires we were adopting a wrong system.

This seems to be the first time that the validity of fire-protection was ever called into question, and there can be little doubt that the theory originated in India and not in Burma.

EVIDENCE IN FAVOUR OF FIRE-PROTECTION.

It may seem superfluous to produce evidence in support of fire-protection, but as its validity has been impeached, it is advisable to show that there are competent foresters who vouch for its beneficial results basing their opinion on facts within their knowledge.

The first witness is Mr. B. Ribbentrop, C.I.E., formerly Inspector-General of Forests. That officer wrote §:—"These, in

* Indian Forester, Vol. XX, p. 285, "Failure of natural reproduction in the Teak Forests of the Coimbatore District."

† l. c. Vol. IX, p. 134, "A note from Coorg about forest fires," by 'Coorg.' This can only have been the late Mr. F. B. Dickinson who was then in charge of the Coorg Forests.

‡ l. c. Vol. IX, p. 359, "Grazing rights in Forests."

§ "Forestry in British India," p. 149 *et seq.*, 1900.

certain provinces almost general, conflagrations are the chief reason of the barren character of so many of our Indian hill ranges..... Their influence is more hurtful in proportion to the dryness of the region in which they occur.....After a fire has swept a few times over the forest, the compactness of its canopy gets destroyed and each successive fire leaves it more open. This being the case, the danger is reduced to a ground fire, which cannot touch the crown of the trees, between which the interspersed dead trees glow year after year like a torch till they are gradually consumed, doing but little and constantly less harm to their wider and wider disconnected neighbours. As time goes on, the process of destruction becomes thus slower and slower, but the end is none the less certain..... My parting advice is to extend fire-protection wherever feasible."

Concrete cases are quoted in support by the author for which the reader is referred to the book itself.

From the pen of the same author we have the following * :—

"The first consequences of these constantly recurring fires are bamboo forests with standard trees in the hills and *Kaing* grass savannahs in the plains. The cover of dead leaves on the ground is annually consumed ; humus, if it was in existence at some former period, has disappeared and cannot form under existing circumstances. The rain-storing power of the forest is lost and the bare friable soil is washed down into the streams.....This erosion does not take place in areas which have been successfully fire-protected for some years and the streams in fire-protected forests become more and more perennial."

In his article previously referred to, Mr. D'Arcy showed that he did not subscribe to Captain Forsyth's views, for he wrote † :—

"Since this was written hundreds of thousands of acres of teak forests have been annually protected in the Melghat with indisputably a good effect to the forests, and the villagers themselves, the wild Gonds and Kukurs, recognize the wisdom of fire-protection."

* Forest Progress Report for British Burma for 1881-82.

† Indian Forester, Vol. IX , p. 359.

Similarly, Mr. Porter added to the passage already quoted *: "I refer only to these particular forests, or to others which may be similarly constituted and situated. The majority of the Madras forests have derived enormous benefit from fire-protection."

Writing of Sal forest in Oudh, Mr. A. F. Broun declared † that it "shows great improvement under protection as proved by enumeration."

Mr. Nisbet stated ‡:—"The south-east portion of the Chaungzauk Working Circle has been successfully protected against fire for the last sixteen years, and the effects are very apparent in the strong contrast between the fire-protected forests and those outside, which are already, so early as the 5th January, either leafless or are fast shedding their dry yellow foliage, whilst the teak trees in the reserve are still in full leaf of a healthy green colour. The prolongation of the active season of vegetation must considerably influence the annual increment on the boles of the teak trees".....

"There can be no doubt that fire-protection, even at its present high cost, is a profitable investment, especially in the dry forests which are far more extensive than those of a moist type."

In 1898, the Inspector-General of Forests, quoting Mr. Hearle, stated § in regard to Chir forests:—"In all the successfully fire-protected blocks round Ranikhet there were, in 1881, 374,836 Chir poles of from 6 inches to 1½ feet in girth, but in 1898 the number was found to be 573,612, which is equivalent to an increase of 53 per cent in less than twenty years, and this in spite of the enormous number of Chir poles granted away yearly to the right-holders. The efficacy of fire-protection should therefore be quite outside the pale of discussion, as it is indeed with everyone who has studied the question seriously."

Mr. E. M. Hodgson, Deputy Conservator of Forests in the Bombay Presidency, writes ‖ concerning the protection of "large areas of mixed teak forest which, until comparatively recently, had

* Indian Forester, Vol. XX, p. 285.

† l. c. Vol. XIII, p. 565.

‡ Forest Administration Report for Burma for 1894-95.

§ Review of the Forest Administration in British India for 1897-98.

‖ Indian Forester, Vol. XXXVI, p. 525, "Fire Conservancy in Indian Forests."

been burnt **every** year. The result is almost invariably an incomplete canopy, unsound trees, few or no seedlings and those that do occur unsound. The various grasses and reeds grow very tall and coarse in a forest of this nature subject to annual firing, thus adding to the difficulty of regeneration from seed and to the injury resulting from fires.

When the fires cease, apart from the obvious advantages to the existing tree-growth, the grass gradually gets less rank, and as soon as the tangled mass has rotted numerous teak, *Dalbergia latifolia*, etc., spring up in vast numbers and develop under fire-protection into sound, not unsound, trees."

The views of the present writer are emphatically in favour of fire-protection. He has not seen any forest in India where fire-protection is not advantageous, all factors considered. Even in the teak areas of Coimbatore referred to by Mr. Porter, he has found that fire-protection has assisted reproduction in the long run, as the sequel will show.

In open grass areas with little or no tree-growth, fires are also harmful in the matter of erosion and deterioration of the soil. Protection in such localities induces the re-appearance, sooner or later, of arboreous vegetation, wherever there is sufficient depth of soil. These remarks should be restricted to the Madras Presidency, the writer having a very limited experience beyond its boundaries.

EVIDENCE OPPOSED TO FIRE-PROTECTION.

We have already seen that Captain Forsyth considered that "by keeping out fires we are adopting a wrong system," that Mr. Dickinson thought that "in heavy teak forest fire does more good than harm," and that Mr. Porter believed that "fire-protection has done no good in the way of natural reproduction" owing to the encouragement of smothering weeds.

S. E. W. (presumably Mr.—now Sir—St. Hill Eardley-Wilmot) wrote in 1890 from the Central Circle, North-Western Provinces* :—"It has been observed that continued successful protection

* Indian Forester, Vol. XVI, p. 152, "On the Treatment of Bamboo Forests."

so favours tree-growth that after some years the bamboos die for want of light."

We now come to the more recent expressions of opinion, and as it is more particularly these that have led to controversy and contradiction, they must be quoted at some length and the several arguments will be serially numbered for convenience in subsequent reference :—

I. Mr. Slade in 1896 wrote * that though young teak seedlings suffer considerably from fire on the trees of that species, owing to their "protecting outside layer of corky bark, the fire has absolutely no effect."

II. That "all other vegetation (with possibly one or two exceptions, though I can recall none) suffers very much more severely in its younger stages than the teak, and consequently the annual fire cannot be considered otherwise than as an agent favouring the growth of teak at the expense of all (or almost all) other species."

III. He questioned whether humus is necessary or even desirable for teak, but admitted that repeated burning of seedlings is responsible for a great deal of the hollow timber found.

This article caused the appearance of others in the pages of the *Indian Forester* in support of the theory, notably one by Mr. F. J. Branthwaite, who wrote† :—"Want of light is a worse enemy to a young teak seedling than ordinary jungle fire .... in those areas which have been fire-protected for the longest time, and that most successfully, not once have I found humus ; earthworms, white-ants, etc., seem to eat up all the leaves and work them into the soil" and "where the canopy is very light owing to the jungle being yearly burnt over, the natural regeneration is better than in the fire-traced areas."

In 1902, Mr. H. C. Walker re-opened the controversy‡ and since then has repeatedly written in the same strain, and it is

* Indian Forester, Vol. XXII, p. 172, "Too much fire-protection in Burma."
† l. c. Vol. XXII, p 257 and 302.
‡ l. c. Vol. XXVIII, p. 293, "Fire-protection in Teak Forests in Lower Burma.

principally his statements and deductions that are to be scrutinised. He asserted :—

IV. "When the seed falls on a thick layer of dead leaves such as accumulate in fire-protected forests, the conditions are very unfavourable to germination and very little natural regeneration is found.

. . . as fallen trees and bamboos and decaying vegetable matter decompose very slowly . . . . the accumulated amount is very great."

V. " . . . . when the leaves are burnt, I think I am correct in saying that only the nitrogenous compounds are lost and that the essential salts are left. Now in a teak taungya plantation seedlings grow most strongly in places where a log has burnt to ashes, in spite of the fact that in such places the loss of nitrogenous matter is greatest and, therefore, this loss cannot be important."

VI. "To a small extent, I think, in protected forests decomposition of leaves takes place by their becoming so dry during the hot weather that they crumble into dust and this process is similar to decomposition by fire."

VII.* " . . . the leaves which fall annually do not accumulate and form humus in a fire-protected area, but when not destroyed by fire are eaten by termites . . . . when destroyed by fire there is no loss of mineral matter."

VIII. "Old age, suppression, etc., appear to me to sufficiently account for the hollow trees we find, and I entirely fail to understand how the burning back of a teak seedling can possibly cause hollowness."

IX.† " . . . . one of the oldest protected areas in Burma, and from the commencement, some forty years, has been successfully protected. Yet, in spite of improvement

* Indian Forester, Vol. XXIX, p. 554, "Fire-protection in the Teak Forests of Lower Burma."

† l. c. Vol. XXX, p. 366, "Fire-protection in the Teak Forests of Lower Burma."

fellings, hardly a teak seedling is to be found although in adjoining unprotected areas natural regeneration of teak is very good."

X.* "There is little doubt that these forests have been burnt over annually for untold periods of time, and, as in spite of this, growth is most luxuriant .... I think the idea of *impoverishment of the soil* may be dismissed as a myth."

XI. "But in Burma earthworms are comparatively scarce."

XII. "I have seen large quantities of dead leaves being devoured by termites and have endeavoured to discover what becomes of the material. It seems that every morsel consumed passes through the bodies of several termites by a process termed lactation, but I cannot discover definitely whether much is returned to the soil. Possibly some of the residue is concentrated in their mounds or nests, more probably both in the case of termites and beetles, the leaves consumed are utilised to build up their structure and then that of insectivorous birds, and then that of other birds and beasts of prey, so that a long time elapses before any matter is returned to the soil."

XIII. "When leaves are burnt only the ash remains, which, however, contains the essential salts."

XIV. "In unprotected areas the leaves are burnt and disappear in March. In protected areas they disappear during the rains. The disappearance is so rapid in both cases, that I should think the probabilities are that there is little difference in the fertility of the soil one way or the other. . . ."

XV. Mr. Walker further contends that middle-aged trees are sound and in any case injury by fire is very slight.

XVI† "....it is practically certain that our deciduous forests have been annually burnt over, not merely for the

* l. c. Vol. XXXIV, p. 339, "Fire-protection in Burma."

† Indian Forester, Vol. XXXVI, p. 356, "Fire Conservancy in Indian Forests.

last century or so but for hundreds of thousands of years."

XVII "... as the result of experiments at Rothampstead, it has been discovered that when soil is heated, the amount of nitrogen is increased '... the nitrogen-fixing bacteria .. are less affected by the heat than the phagocytes."

XVIII* .... Criticising a note by Mr. H. A. Latham, Mr. Walker doubts that the minerals in leaf ash are lost to the soil through washing of the ashes down slopes into the streams and through the agency of wind.

XIX. He further denies that floods materially decrease in areas protected from fire or that streams issuing from them are more limpid or that erosion is greater in unprotected forests.

Mr. Ribbentrop described† a class of forest in Burma "in which the valuable species are found with an under-growth of evergreen dense, periodically and gregariously-flowering bamboos, which more or less prevent the natural reproduction of tree-growth at any other time except whilst the bamboo is seeding." In such forests he admitted that "the use of properly-controlled fires in selected areas is indicated when the bamboo flowers."

Referring to vestiges of teak found lingering on in the midst of evergreen forest, the late Sir Dietrich Brandis wrote‡:—"When teak first sprang up here, perhaps two centuries ago, the forest must have been altogether of a different character. The cessation of jungle fires for a few years, either caused by rainfall during the dry season, or because there were no travellers or others to set fire to the jungles, may have permitted the accumulation of vegetable mould and favoured the springing up of a new class of trees among the teak. Let these trees of the dense evergreen forest once take possession of the ground, so as to keep off jungle fires, and the progress of their growth is irresistible ... The

* l. c. Vol. XXXVI, p. 679, "Fire Conservancy in Indian Forests."

† Forest Administration in Burma in 1895-96.

‡ Indian Forester, Vol. XXIX, p. 187, "Teak in Evergreen Forest."

springing up of teak seedlings in the dense shade is out of the question, and the teak dies of old age without any chance of propagation."

Mr. H. Carter* supports Mr. Walker in some of his contentions and adds :—"On sound fairly large trees I don't think fire has any effect at all until they begin to lose vitality, or unless an exceptional amount of débris is collected round them . . . . The effect of a thick layer of leaves such as is found in a fire-protected forest in preventing the radicle reaching the ground is known to every Forest Officer."

Mr. R. S. Troup published† some figures of enumerations in Tharrawaddy, showing a much larger number of seedlings and young poles in burnt areas than in the protected ones. Moreover, there were fewer unsound and suppressed trees. The dead trees appeared to have come by their end through suppression and not by fire. He added :—"It is impossible . . . to give any idea of the terrible destruction which is being wrought in our once valuable moist mixed forests by prolonged fire-protection."

Mr. Bruce gave an interesting account‡ of reproduction of teak in forests worked intensively for bamboos :—

"Both inside and outside fire-protected areas the effect is the same, but outside the germination is better."

". . . . once away from the areas attacked by bamboo cutters and inside the fire-protected area, the bamboo is found covering the ground with magnificent clumps, while careful and prolonged search will not enable one to discover one teak seedling which has germinated in the last nine years, *i.e.*, since fire-protection was started, while the old teak stools even are being killed off by the dense shade of the bamboos combined with that of other trees."

In 1907, Mr. F. Beadon-Bryant, then Chief Conservator in Burma, quoted figures of countings in Tharrawaddy§ which revealed a considerable shortage of teak saplings under one foot

* Indian Forester, Vol. XXX, p. 363, "Fire-protection in the Teak Forests of Burma".

† l. c. Vol. XXXI, p. 138, "Fire-protection in the Teak Forests of Burma.

‡ l. c. Vol. XXXII, p. 390, "The Reproduction of Teak."

§ l. c. Vol. XXXIII, p. 537, "Fire Conservancy in Burma."

in diameter in fire-protected compartments. He then expressed the opinion that "Prolonged fire-protection results in a marked decrease of trees of the younger classes." . . . those which spring up after fire-protection "for the most part either damp off or are suppressed by the heavy cover of bamboos which benefit enormously from fire-protection and which are driving out practically everything before them . . . . What is taking place in Tharrawaddy is taking place in all moist forests under fire-protection in Burma, *i.e.*, the teak is being gradually and surely killed out. In forests annually burnt over, on the other hand, the cover remains considerably lighter than where protection is in force and the young teak resisting the effects of fire better than its companions is able to and does establish itself."

With one exception in favour of bamboos, all the facts and arguments hitherto quoted refer to teak. We find, however, that the same effect as the result of the same cause has been claimed in the case of two other species: Sal (*Shorea robusta*) and Chir (*Pinus longifolia*).

The late Mr. C. C. Hatt seems to have been the first to have pointed this out in connection with Sal in 1905.* His asseveration found an echo in the Forest Administration Report for British India for 1904-05, where we read:—"In the damper forests, however, whilst fire-protection has in some cases caused the establishment of well-stocked forests of the desired species, it has also encouraged the growth of many worthless trees, and it will be necessary to adopt measures to assist the sal against these undesirable competitors . . . ."

Similar evidence has been furnished by Mr. E. M. Coventry,† Mr. A. L. McIntire,‡ Ranger Sukh Lal Dat§ and Ranger Sen Gupta.‖

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* Indian Forester, Vol. XXXI, p. 568, "Mixed Sal Forests and Fire-protection."

† l. c. Vol. XXXIII, p. 174, "Notes on Sal Reproduction."

‡ l. c. Vol. XXXIII, p. 312, "The Reproduction of Sal from seed."

§ l. c. Vol. XXXIII, p. 456, "Fire-protection and Natural Regeneration" and Vol. XXXV, p. 154, "Light burning and Natural Reproduction of Sal."

‖ l. c. Vol. XXXIII, p. 549, "Reproduction of Sal from seed in the Jalpaiguri Division."

It is interesting to find that these views are supported by an American Forester who visited the Sal forests of Assam—Mr Barrington Moore, M. F.—who wrote*: "...the under-growth comes up very much weakened or not at all after a fire, whereas the Sal comes up as vigorously as ever . . . Obviously the only alternative (to costly thinnings) is to burn this under-growth . . . Any one who considers the use of fire as a breach of all the laws of sylviculture need only see the excellent condition of a forest continuously burnt and then protected for one year."

As regards Chir, Mr. E. A. Smythies† gives some facts observed in the neighbourhood of Ranikhet, and claims that there is "in absolutely unprotected open forests, regularly burnt every year, regeneration as fine as anything we can show in the scientifically managed, fire-protected, closed-to-grazing areas" and that as a result of protection "we have been obliged to resort to artificial sowing in our regeneration coupes."

DISCUSSION AND CRITICISM OF THE EVIDENCE.

When the evidence is concerned with generalitis, such as the value of humus, of nitrogen, etc., the question is comparatively simple; but when one turns to points of fact: the presence or absence of seedlings and of humus, the occurrence of erosion, etc., the enquirer unacquainted with the locality is at an obvious disadvantage. In such circumstances one must depend upon the writings of those in a better position to judge. On referring to these reports, however, one is faced by a bewildering situation very far removed from unanimity; it is precisely this predicament that dictated the compiling of this paper.

In order to make the nature of these puzzling contradictions clear, a few conflicting statements are pilloried below:—

Extract from the Burma Forest Administration Report for 1896-97.

By Mr. G. R. Long, West Salween.	By Mr. H. B. Anthony.
"That, outside fire-protected areas the natural regeneration	"In many parts of the fire protected Meple-Thaungyin

* I. c. Vol. XXXV, p. 213, "Notes on the Forests of Northern India and Burma."
† I. c. Vol. XXXVII, p. 54, "Fire-protection in Chir Forests."

of teak seems more frequent than within areas protected from fire. In the Sinswe Reserve fire-protection is the immediate cause of a dense undergrowth through which teak seedlings unassisted by cultural operations can never be expected to force their way."

Tharawaddy Division.

"In non-fire-traced forests the reproduction of teak is good, but inside fire-traces, it is decidedly scanty."

Reserves when the upper canopy is not too dense and where bamboos have not obtained a footing, the natural reproduction of teak is plentiful and good, but in the other reserves and open forests it is much poorer, the amount of reproduction being in exact proportion to the amount of protection afforded to the forest.

In the Thaungyin Ranges, where the villages are few in number, the forests suffer but little from the inroads of men and cattle, and not infrequently tracts of greater or less extent accidentally escape the annual conflagrations.

In these forests, therefore, it is not unusual to find teak seedlings and poles here and there, but in the open forests of the Hlaingwe Range, which are greatly resorted to by men and cattle and through which fire sweeps with unfailing regularity every year, natural reproduction of teak is absolutely at a stand-still."

Extracts from the Burma Forest Administration Report for 1909-10.

Yaw Division.

"... after a patch of cultivation has been abandoned by the Chins, dense crops of teak seedlings appear. These, however, are soon overtaken in height by a dense growth of grass and disappear in the fierce fires that sweep the *Ponzo*."

Toungoo Division.

"On the more shady slopes and in the valleys, the young teak is killed out by rank grasses, etc., which flourish with the help of fire-protection."

Could anything be more disconcerting!

We may now see whether there is agreement on the several points which have been serially numbered above, and consider whether there is reason to disagree with the deductions.

I.—Immunity of teak trees from fire.

F. B. D. commenting on Mr. Slade's article wrote* :—"Teak trees are, as a matter of fact, often badly injured by jungle fires .... Sometimes the tree is killed outright."

Another opinion runs† :—"I have just passed through a promising young timber forest of teak ... and other species, where practically every stem of this immature crop is seriously injured by *leaf fires*, which have hardly even blackened the trunks, and thus the well-being of the standing stock and the future of the forest as a whole has been seriously endangered."

In 1901 Mr. H. J. Porter reported‡ :—"The tree which suffers most from fire is the teak on account of the oil it contains, there are not a great number of this species, but it is doubtful if there is a sound one in the whole range."

Mr. A. Rodger published figures § showing that "8 per cent of the standing stock of marketable teak trees have been so much damaged by fire that they have lost a considerable part of their commercial value, and further that 52 per cent have been so damaged as to impair their vitality and lead the way to greater damage later on."

Further enumerations communicated ‖ by the same officer showed only 7 per cent trees undamaged by fire out of 1,103 counted; out of 93 per cent damaged 81 per cent had lost part of their commercial value.

Finally, the late Sir Dietrich Brandis reported¶ :—"Trees, however, that are not perfectly sound, for instance, that have some

* Indian Forester, Vol XXII, p. 258, "Too much Fire-protection in Burma."

† l. c. Vol. XXVII, p. 124, "On Leaf Fires," by O. C.

‡ Working-Plan Report for the Cumbum Range, Madura District.

§ Indian Forester, Vol. XXX, p. 372, "Fire-protection in the Teak Forests of Burma."

‖ l. c. Vol. XXXIII, p. 17, "The Effects of Fire in Teak Forests."

¶ Report on the Teak Forests of Pegu for 1856.

dry branches on them, or where the bark near the ground has fissures, which is not unfrequently the case with teak—such trees suffer serious damage from these jungle fires, and not seldom become hollow, or otherwise injured."

"Greater still is the damage done to seasoned trees and logs by these fires. For these are either destroyed or so much injured that they lose considerably in value . . . ."

II.—Greater immunity of teak over other species.

In the article already quoted, F. B. D. stated his opinion that other species spring up more rapidly if anything than teak.

See also the quotation above from Mr. Porter.

As will be seen later, the writer of this note has observed that in the Anamalai forests of South Coimbatore (the very ones in which Mr. Porter lamented the absence of teak regeneration), teak showed signs of more frequent and greater damage from fire than any other species associated with it.

In this connection Mr. J. W. Oliver states* :—"It must be admitted that teak does withstand fire better than many other trees, but there seems no reason to suppose that this is the result of adaptation, for other trees have been exposed to precisely the same influences and have not developed means of resisting the effects of fire."

Moreover, if fire is to be "considered . . . as an agent favouring teak at the expense of all (or almost all) other species," and if the teak forests have been "burnt over . . . for hundreds of thousands of years" (points X and XVI) it is pertinent to enquire why we do not find large areas of pure (or almost pure) teak forest.

III.—Necessity of humus for teak.

This point was dealt with by Mr. J. W. Oliver,* who wrote: "... the theory ... that the teak tree prefers a soil devoid of humus is opposed to the fact that the best teak is generally found on well-drained, alluvial flats on the banks of streams where the soil is entirely composed of fine earth mixed with vegetable remains washed down from higher ground."

* Indian Forester, Vol. XXII, p. 259, "Too much Fire-protection in Burma."

IV.—Accumulated leaves hinder germination.

Mr. F. J. Branthwaite criticising some remarks by Mr. Slade wrote as follows on this very subject* :—"Fire-protection prevents the leaves, grass, etc., being burnt, and as they are not eaten and worked into the soil until after the first burst of the monsoon, the seeds find a lodging amongst these leaves, grasses, etc., and are retained and germinate even under a thick canopy of bamboos."

Then, teak seeds do not germinate at once, but during the rains, and as the leaves disappear rapidly through the destructive agency of insects, etc., once the rains set in, it is difficult to grasp why the radicle of the germinating seed is prevented from reaching the soil.† For the rapid disappearance of the leaves as soon as the rains set in, we have the evidence of Mr. Walker himself, *vide* points VII and XIV.

V.—Loss of nitrogenous compounds unimportant.

The instance chosen by Mr. Walker to support this point is not convincing. No one claims that an ordinary fire dissipates the nitrogen stored in the soil, but only that contained in the matter burnt. The reason for the stronger growth of the seedlings at the place where a log has burnt to ashes is that they have benefited by the extra quantity of other plant-food supplied by the ashes, there being a sufficiency of nitrogen in the soil. The nitrogen in the log, however, has been lost.

VI.—Pulverised leaves compared with leaf-ash.

Mr. Walker might as well contend that the ashes of tea leaves are equivalent to tea-leaf dust.

VII.—See reply to XIV.

VIII.—See reply to XV.

IX.—Absence of teak seedlings in fire-protected forests.

That there is some diversity of opinion on this subject the "pillory" will have shown. Moreover, it is fairly certain that

* l. c. Vol. XXII, p. 302, "Too much Fire-protection in Burma."

† Indian Forester, Vol. XXX, p. 363, "Fire-protection in the Teak Forests of Burma."

immediate good results cannot be expected invariably on the initiation of fire protection and the closing sentence of the following extract permits one to question whether the forest referred to had been *successfully* protected for forty years. "* . . . is it not the case that everywhere the first effects of fire-conservancy are inimical to natural reproduction. Does it not favour the rapid growth of grass, shrubs and soft-wooded species more than that of the principal species? When, however, the fire-protection is continuously successful for a sufficient length of time the conditions are altered. Does not then the rank growth of grass die down, and is it not then replaced by other finer sorts which afford no obstruction to the germination of the seeds, while the shrubby growth serves as protection to the young seedlings?"

"If this is so, then what is wanted is continuous successful protection. I have just been reading the last Burma Forest Report, and have been much struck by the marked absence, year after year, of continuous success in fire-protection."

The following from the pen of Sir D. Brandis † does not entirely support the contention: ". . . Teak forests, therefore, in a jungle of this bamboo (Wapzoogelay) are much exposed to severe injury from fires. The number of seedlings is consequently diminished...."

The forests are then classified and remarked on:—

"*First Group, alluvial.*—Jungle fires not regular and not very dangerous. Seedlings abundant . . .

Second Group.—Jungle fires regular and destructive. Seedlings less numerous than in first group.

Third Group.—Bamboos mostly deciduous. Jungle fires regular and not very destructive. Seedlings numerous, but generally burnt down to the ground once or twice before they make a start strong enough to enable them to resist the effects of the fire"

It must be conceded, however, that there is a good deal of evidence to show that in some localities at least, the protection

* l. c. Vol. XXX, p. 305, "On certain important Forest questions," by "Non-Burman."

† Report on the Attaran Forests for 1860, p. 51.

from fire afforded so far has not resulted in satisfactory natural regeneration of teak when not assisted by other operations, and that seedlings are more abundant in adjoining similar areas burnt over annually.

It does not follow that this state of things is permanent and it may alter with continued treatment, as indicated by Mr. Clutterbuck. *

"It would appear that where reproduction is still wanting in areas which are protected from fire, it is because the areas have not been protected for a sufficient length of time."

"Recently we saw an area of Sal forest which had been protected from fire for nearly thirty years in which natural reproduction has established itself only during the past three years. If the area had been inspected four years ago, it would have appeared that protection from fire for some twenty-six years had been a failure as far as regeneration was concerned."

"After an area has been subject to fires for a great number of years, the soil often gets into a very bad state and it may take many years of protection to bring it into a suitable condition to form a seed-bed for the principal species."

The above remarks seem pregnant with significance. It seems probable, too, that the longer an area has been subjected to fire so much the longer will be the period required for the restoration of normal conditions. The length of the period of recuperation will be determined by general conditions and the special local circumstances of the species involved.

X.—See reply to XVI.

XI.—Dearth of earthworms in Burma.

As we shall presently see, both Mr. Ribbentrop and Mr. Nisbet have referred to the "myriads" and "countless millions of earthworms, ants, beetles, etc.," in Burmese forests. It is not very material, however, whether it is by earthworms or other creatures that the débris are consumed, but is not the absence of earthworms reported by Mr. Walker an effect of annual fires

* Indian Forester, Vol. XXXV, p. 154, Editorial comment on "Light burning and Natural Reproduction of Sal."

and a sign of deterioration? M. Jacquot * points out that one of the results of fire is the migration of earthworms, and insists on the harm to the forest through this evacuation.

XII.
XIII. } *See next section.*

XIV, VII, XII and XIII can be taken together with this point, as all contend that *all essential plant foods remain in the ash of burnt leaves and that there is no practical difference whether the leaves are burnt or decomposed by animals and decay.*

Now here only one of two things can be meant: either that nitrogen is not an essential plant-food, or that it remains in the ash. Both conceptions are false.

Mr. E. Henry wrote in the *Revue des Eaux et Forêts*† :—"Forest trees are little behind agricultural crops in their demand for nitrogen . . . Five to eight per cent of beech wood is nitrogen and the leaves a little more." And again ‡—"In forests where the soil covering is preserved the proportion of nitrogen goes on increasing; on the other hand, removal of litter reduces it rapidly. If repeated, the vegetation languishes for want of nitrogen."

Much more in the same strain could be adduced, but it will suffice to refer enquirers to the text-books and to point out that even for such woody crops as coffee nitrogen is the principal ingredient of the manures used, except when the intention is merely to remedy a deficiency of one of the other plant-foods.

Turning to the loss of nitrogen through burning, this loss is in exact proportion to the completeness of the consumption by fire. Thoroughly burnt ashes do not contain even traces of nitrogen, the whole of which is volatilised and given off into the air, where it is available to a few species of trees only. The ash contains other elements of plant-food and, therefore, is a valuable fertiliser.

When leaves and débris are allowed to decay gradually and even when rapidly devoured by insects, etc., the nitrogen is not set

* "Incendies en Forêt" by A. Jacquot, translation, p. 215.

† ndian Forester, Vol. XXIII, p. 439. "Nitrogen and Forest Crops." Translation by F. Gleadow.

‡ Incendies en Forêt," by A. Jacquot, translation, p. 197.

free, or at any rate but a small proportion is lost. It is not the nitrogen that builds up the frame of the leaf-eating creatures, but mainly the carbo-hydrates, the nitrogen being ejected in the *fæces*, which are notoriously rich in that element. The greater portion of the nitrogen in the leaves, etc., therefore, is returned to the soil when the soil-covering is eaten, and that probably very rapidly.

The argument that the nitrogen is transferred to the frames of insectivorous insects and birds, and then to that of birds and beasts of prey, is somewhat ingenuous and would have weight only if we assume a series of insectivorous and carnivorous animals waiting each to snap up the next smaller before it has had time to digest its meal, in perpetuity. In practice the substance must sooner or later return to the soil either in the form of *fæces* or the dead body of the ultimate recipient—the return of the nitrogen to the soil is merely deferred.

We also find it claimed that no humus is formed and that there is no practical difference whether the leaves are eaten or burnt. The subjoined extracts do not support this proposition :

*"In humus produced above the water-line, all trace of vegetable structure is destroyed by the leaves being gnawed and passed through the bodies of earthworms, caterpillars, wire-worms, etc. . . Experiments with dead leaves pulverised by the action of these animals, in comparison with the same leaves not attacked by them show that little or no influence on the rate of decay results from their action. After passing through their bodies, the organic matter is still fit to nourish moulds and bacteria, and when these have been multiplied sufficiently to accumulate a fresh stock of protoplasm, the earthworms, etc., attack it again, and so destroy all trace of structure."

†"In swallowing portions of humus and assimilating their nutritive principles, worms reduce the earth to a sort of paste and so contribute to the improvement of the soil . . ."

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* Indian Forester, Vol. XVII, p. 330. "The Formation and Properties of Humus."

† Indian Forester, Vol. XXI, p. 370 "Forest Soil." Translated from the *Revue des Eaux et Forêts*, by A. F. G. (Gradon.)

Mr. Nisbet as Conservator of Forests, Pegu, reported as follows* :—" To counteract this (washing away of the soil) and to produce good surface soil as speedily as possible, nature appears to have made the wonderful provision that countless millions of earthworms, ants, beetles, etc., should have the power of consuming such forest débris as fallen stems, dead wood, leaves, etc., and, after extracting their requisite nourishment from it, of emitting the *fæces* not in the form of a more or less altered organic matter, but as a very fine pure and fertile loam. Throughout the whole year some or other of these myriads of animals are at work converting the débris into good soil to replace what has been or is being washed away by the heavy rainfall, but the greatest activity seems to be at the termination of the rains and at the commencement of the wet season. . . ."

"It has also been shown that the dead leaves, although they do not form humus are when protected from fire rapidly restored to the soil in a form in which they can be easily assimilated by plants."

Next, the Inspector-General of Forests (Mr. Ribbentrop) remarks in his review of the Forest Administration of Burma for 1895-96 :—" However, there can be no doubt that in fire-protected forests the leaves and other decaying vegetable substances are returned to the earth and the chemical properties of humus are imparted to the surface soil, which is, moreover, loosened by the action of myriads of earthworms, ants, beetles, etc."

" It seems to me immaterial whether the manuring principles are brought back to the soil by decomposition, or through the *fæces* and decomposing bodies of worms and insects, like stable-manure ploughed under in fields."

Another Inspector-General of Forests has said† :—" In the Tharrawaddy forests first protected, there is now a perfect forest soil, soft under foot, and although true humus formed from decaying leaves may not be present, the soil must retain the same nut itive properties as would true humus."

* Forest Administration Report for Burma for 1894-95.

† Indian Forester, Vol. XXXIII, p. 537, " Fire Conservancy in Burma," by F. Beadon-Bryant, 1907.

Finally, we find the following words in one of the best works on soils* :—" The key to maintaining the fertility of the soil is to have plants decaying in it all the time."

XV (also point VIII).—*Middle-aged trees claimed to be sound and unsoundness ascribed to suppression and old age.*

It has already been shown that there are dissentients to this proposition. A few more opinions may be useful, however.

An anonymous contributor to the *Indian Forester* declared† " . . . hollow trees are not necessarily by any means always old trees . . . many, nay most, full grown teak trees are hollow, sometimes for several feet up the butt . . . damage to the growth of the tree is caused by the scorching of the bark which interferes with the rising of the sap ; and it is to this cause that in the majority of cases the injury is due in the growth of the tree, which Mr. Walker attributes to suppression by shade."

Thus Mr. Beadon-Bryant‡ :"—There can be no doubt that much of the unsound teak to be found in all our forests is due to the action of fires, which cut back the young trees year by year until they can send up a shoot strong enough to resist fire. The damage thus sustained in its earliest years undoubtedly causes many a tree to become unsound, and as the unsoundness develops, the annual fires do more and more damage to the tree."

Mr. (now Sir) S. Eardley Wilmott supports this opinion.§ " The effects of fire on established teak trees, young and old, was not disputed, even leaf fires of small intensity produced injuries in the base of the stems that soon caused dry-rot and other unsoundness in the heart of the timber."

Finally, Mr. H. Carter, while assenting to some of Mr. Walker's other points, testified ‖ :—"The loss of young seedlings by fire is undoubted, and although despite fires seedlings grow up it is at the

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* " Soils, " by S. W. Fletcher.

† Indian Forester, Vol. XXX, p. 156. " Fire-protection in the Teak Forests of Lower Burma," by " An Old Protectionist."

‡ Indian Frester, Vol. XXXIII, p. 537.

§ " Forest Life and Sport in India," p. 194 ; published 1911.

‖ Indian Forester, Vol. XXX, p. 363, " Fire-protection in the Teak Forests of Burma."

oss of several years' growth, estimated at ten, and at the cost in many cases of scars near the ground."

See also Mr. Slade's admission in point III.

XVI (together with X).—*The great antiquity of forest fires postulated.*

This assumption is altogether gratuitous. There can be no doubt that forest fires have increased with the multiplication and spread of man. Practically speaking, all fires originate, directly or indirectly, through the agency of man. In the dim past when men were few, and even now in uninhabited tracts, the forests escaped and do escape.

It will have been noticed in some of the extracts quoted that the authors associate the recurrence of fires with the proximity of men and their herds. For instance, Sir D. Brandis wrote: "The cessation of jungle fires . . . either caused by rainfall or because there were no travellers to set fire . . ."

In North America forest fires were formerly neither as frequent nor as widespread as in the present times, in spite of increased care and improved measures of control. The *Journal of Forestry* declares* that forest fires are much more frequent now than in the past.

XVII.—Nitrogen in the soil increased by heating.

The increase here referred to is due to the phagocytes inimical to the nitrogen-fixing bacteria being more sensitive to heat than the latter, consequently these are freed from their enemies for a period after the temperature has been raised sufficiently to kill the phagocytes without injuring the *Azotobacters* and their allies.

No doubt something similar happens in the surface layers in the case of a forest fire, but in the layers burnt the nitrogen-fixing bacteria themselves are destroyed, and this damage far outweighs the very small benefit in the layers immediately below.

But even this neglects to take into account the far more important loss through the destruction of the nitrifying bacteria

* Quoted in the Indian Forester, Vol. IX, p. 308, "Fire Conservancy from the Journal of Forestry."

present in the fallen leaves and débris. This loss is by no means negligible, as we are informed by M. E. Henry* :—"I think there is, however, a more important and general compensating cause, hitherto ignored, namely, the fixation of nitrogen from the air by dead leaves," and that author goes on to state that dead leaves take up from half to three-fourth per cent. of their weight of nitrogen from the air.

M. Détrie may also be quoted† :—"The removal or mere moving of the layer of dead leaves, not only interferes with the formation of vegetable mould, but actually diminishes the fixation of nitrogen in the soil by stopping the development of micro-organisms."

So that by burning the soil-covering not only is the forest deprived of the nitrogen in the layer destroyed—amounting according to Henry, to from five to eight per cent of its weight—but also of the nitrogen that would have been obtained from the air by the agency of the micro-organisms destroyed with it.

Further, it must be remembered, that the floor of the forest, especially in the tropics, is generally covered with a growth of suffrutescent plants and shrubs, some of which (usually *Leguminosæ*) are capable of fixing free nitrogen from the air. These plants, together with their nitrogen, are destroyed.

The crux of the question is whether nitrogen is an essential element of plant-food. This has already been dealt with in the answer to point XIV; the conclusions‡ of an eminent observer—Dr. A. Schwappach—the results of experiments extending over several years may be recorded as additional proof:—"These figures would seem to show conclusively that the removal of dead leaves is more harmful on poor soils than on fertile ones, that on the former the practice may diminish the production of wood by more than one-half. Also, that the influence of the removal of the leaves is greater the more frequently and the longer the practice is continued."

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* Indian Forester, Vol. XXIII, p. 439, "Nitrogen and Forest Crops."

† Indian Forester, Vol. XXIV, p. 1, "The fixation of atmospheric nitrogen by dead leaves."

‡ l. c. Vol. XIX, p. 132. "Influence on the Vegetation of a Forest on the removal of Dead leaves from the soil."

This much admitted, it seems impossible to deny that annually recurring fires must diminish the quantity of nitrogen in the soil until, at the long last, the amount left is insufficient to support a forest crop.

XVIII.—Ash not carried off by wind or water.

As we have seen this statement was made in denial of a suggestion from Mr. H. A. Latham, but the latter gentleman is not the first to bring this loss to notice, as the next few paragraphs will show.

"* . . . the whole of the leaves and branches falling from the trees are consumed by the jungle fires, and the ashes instead of affording nourishment to the trees are washed away by the first rush of the rain."

"† . . . on dry steep hill-slopes . . . a few days after a fire has passed through the forest, the burnt localities present the appearance of having been carefully swept of all leaves, the ground being perfectly bare, and every trace of ashes being removed by the wind."

"‡ In the case of fires the wind dissipates the ashes and the rain washes them away, especially on hilly ground. Very little of what has been extracted from the soil by vegetation is returned to it."

Many similar assertions could be cited but one more will suffice:

"§ . . . the villagers . . . firing the hillsides in order that their fields below may be benefited by the ashes which are washed down by the rain." (This practice has come under the present writer's own notice in the Ganjam District.)

XIX.—Floods and erosion not greater in unprotected areas.

Such a statement cannot but create the impression that the author's experience in this direction has been extremely limited

* Report on the Attaran Forests for 1860, by D. Brandis.

† Working Plan of the Thonze Reserve, by J. W. Oliver.

‡ Forest Administration in Burma in 1895-96, by Mr. B. Ribbentrop, C.I.E.

§ Letter No. 74, dated 7th January 1910, from the Chief Secretary to the Government of Bengal to the Government of India.

Probably he would restrict the application of his remarks to Burma but as we will now see, other officers in Burma find their observations leading them to opposite views. Moreover, it is stated that fire-protection encourages a rank growth of grass and soft-wooded shrubs, so dense, indeed, as to choke teak seedlings. It must be clear, beyond the necessity of proof, that such a covering to the soil is bound to act as a check on surface wash and in its absence erosion actually does take place, as reported by Mr. J. W. Oliver * :—"The consequence (of fire) is that when the heavy monsoon rains set in, there is no covering to protect the soil and the soft shale of which these hills are composed is rapidly eroded. . . ."

Besides the living soil-covering the soil has also been robbed by the fire of the protection afforded by the layer of dead leaves, etc. Even small stones lend their aid as pointed out by Mr. J. Nisbet †: "During the torrential rains of the south-west monsoon in Lower Burma, the softest top layer of the soil on the hillsides is washed away for a depth varying from 1 to 3 or 4 inches, save only where protected by a short soil covering or even by small stones often found topping stalagmite-like pinnacles of soil in the succeeding dry weather." If small stones can achieve this how much more can be expected of growing herbage and the large fallen teak leaves especially when sodden.

But there are other results of the burning of the soil covering which have not yet been taken into account : the loss of seeds and the drying up of the soil.

On sloping ground when the soil is bare, seeds are largely carried off into the water-courses and are lost to the forest, whereas where the leaves and débris remain many of the seeds are caught up and germinate *in situ*.

Further, though it is contended that the leaf fires merely have a stimulating effect on the thick-walled teak seeds without injuring them, that actually a large number are killed cannot be doubted in the face of recorded observations.

* Working Plan of the Thonze Reserve, by J. W. Oliver.

† Forest Administration Report for Burma for 1894-95—remarks by Mr. J. Nisbet, Conservator of Forests, Pegu Circle.

Sir D. Brandis wrote*— "Lastly, the jungle fires, in a great measure retard the increase and renovation of the teak forests, by destroying an immense quantity of teak seeds that cover the ground and might otherwise have germinated."

Similarly F. B. D. †:—"I have frequently cut open scorched teak seeds and found the kernel shrivelled up and useless."

As regards protection against dessication, Mr. Nisbet affirmed.‡:—"The soil is nevertheless to a considerable extent protected from evaporation during the hot weather by the dead leaves lying on its surface which remain undestroyed until the herbaceous growth, usually found during the rains . . . has sprung up."

Before leaving the subject of teak, attention may be drawn to the fact that Mr. Walker argues that even admitting that a certain amount of commercial depreciation is occasioned by fire, the gain secured by protection is incommensurate with the expenditure entailed. As Mr. Rodger has shown that this depreciation extends to 60 per cent of the crop, one is justified in enquiring whether Mr. Walker is prepared to rest content with a 40 per cent standard of soundness.

We can now refer briefly to the other three species that at one time or another have been claimed to be adversely affected by fire-protection.

BAMBOOS.

The reference to bamboos was by Mr. Eardley-Wilmot, the same gentleman wrote a year later §:—"Since writing on this subject I have had the opportunity of inspecting the bamboo forests of Bundelkhand, where the conditions of climate and soil vary considerably from those obtaining further north. . . . In result the bamboo of Bundelkhand . . . suffers much from forest fires, so that there fire-conservancy is evidently a necessity if we wish to preserve and improve the growth. In writing of fire-conservancy

* Report on the Teak Forests of Pegu for 1856.

† Indian Forester, Vol. XXII, p. 258, "Too much Fire-protection in Burma."

‡ Forest Administration Report for Burma for 1894-95.

§ Indian Forester, Vol. XVII, p. 184, "On the Treatment of Bamboos."

relatively to bamboo forests, it is, therefore, very evident that local details are all-important."

Shorea robusta.

With regard to this species the present writer can vouch from personal experience in Ganjam for its immediate response to fire-protection in the shape of a dense vigorous advance growth. The rainfall averages 50 inches ; in the hot weather the forests become very dry. But even in damper forests fire-protection has benefited sal, as we have seen in the sentence quoted on page 201.

Pinus longifolia.

In reply to Mr. Smythies' article, Mr. M. R. K. Jerram wrote as follows* :—". . . there are instances in which annual fires undoubtedly do damage beyond injuring seedlings and young plants. . . . I have observed damage to trees of all ages by annual fires. The fire gets into the crowns and sweeps right through the clump klling many, occasionally all. In spite of fire having swept through the area in the previous year, the following season's fire does sometimes actually reach the crowns of poles thirty feet high and probably of poles even higher than this."

CONCLUSIONS.

It is hoped that the arguments on both sides have been fairly exposed in the foregoing pages, and we may now consider what general deductions may be made from this review.

Firstly, the want of unanimity in matters of fact is forced on one's notice ; *secondly*, it is evident that conditions differ so greatly even in neighbouring localities, that it is very unsafe to generalise.

One point must be conceded to the "too much protection" school. In certain localities and under certain conditions fire-protection appears to be inimical to natural regeneration. But the question then presents itself : Cannot the undoubted benefits of fire-protection be secured while providing for natural regeneration by other means ?

* Indian Forester, Vol. XXXVII, p. 394.

The solution seems to lie in improvement fellings and cleanings. It is impossible for those unacquainted with the special tracts in question to form an opinion as to the possibility of such operations on a sufficient scale, and some—Mr. H. Carter, for instance—say that improvement fellings have not, will not, or can not be carried out in the necessary amplitude. Others, *e.g.*, Mr. Troup for Tharawaddy and Mr. Walker everywhere, tell us that in spite of improvement fellings there is practically no natural regeneration in protected forests.

To the latter we may quote the statement of Mr. J. Nisbet * that improvement fellings are necessary in teak forests even when burnt over, and also the following extract from the article by Mr. Bruce, already noticed, regarding the Namme Reserve of the Ruby Mines Division† :—"This forest was once evidently the ordinary mixed teak forest with *tinwa* (*Cephalostachyum pergracile*), but has been for the last fifteen years or so intensively worked by villagers for bamboos . . . The effect of the continuous and yearly felling of the bamboo has been marvellous, practically a huge improvement felling has been done free and regularly for the last fifteen years, the result being that teak has sprung up in a way that baffles description . . . Both inside and outside fire-protected areas the effect is the same, but outside the germination is better." It seems certain, therefore, that improvement fellings properly conducted will be effective. There remains the question of the possibility of carrying them out. Though probably it will not be possible for many years to come to effect such improvement fellings over the whole of the vast areas of teak forest, yet the subjoined extracts will indicate that far more than has been done in the past can reasonably be expected.

"‡ The difficulty of carrying out improvement fellings has been habitually exaggerated. Two divisions in Burma last year managed 23,000 acres of good work between them."

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* Indian Forester, Vol. XXV, p. 202, "Notes on Improvement Fellings for the benefit of Teak in fire-protected Reserved Forests, Burma."

† l. c. Vol. XXXII, p. 390, "The Reproduction of Teak."

‡ Indian Forester, Vol. XXXVI, p. 126, "Teak in Burma," by O. P.

"* It is generally held to be impracticable to carry out even the small amount of improvement fellings at present prescribed. Nevertheless, I will attempt to show that it would be possible to carry out a scheme of improvement fellings on a rotation of ten years, which would involve at least three times the amount of work." The author goes on to show how this can be done.

This being from the pen of Mr. H. C. Walker, we may well exclaim : "What more can the quality want ?"

Just at the time he had completed this review, the writer was unexpectedly transferred to the charge of the South Coimbatore Division ; it may well be imagined that he eagerly embraced the opportunity of inspecting the very forests Mr. Porter wrote about in 1894 ; a few remarks on what he observed in one block may prove interesting.

As Mr. Porter has already done so† it will not be necessary to describe the forest here. The area has been fire-protected for about thirty years, and excepting one fire over a small portion in 1907, with success. In places the canopy is far too incomplete and there is much tall grass, but it is interesting to see numerous teak seedlings forcing their way through it without being greatly affected. Even under cover teak seedlings are coming up, though it must be admitted, not very abundantly. This is being remedied by improvement fellings, regeneration operations and weedings These operations are costing less than three rupees an acre (this does not include fellings the cost of which is covered by the sales, of the material cut), and about 120 acres are worked over annually in this block.

A very noticeable feature is that very few of the teak trees are straight or sound ; almost every one bears signs of injury by fire in the shape of deep-seated hollows and wounds extending right to the heart of the stem, embracing often half its girth and frequently stretching from ground level to a height of 10 to 12 feet. These injuries are far more frequent and far more severe in the teak than in any of the other species.

* l. c. Vol. XXXVII, p. 612, "Sylviculture in Burma," by H. C. Walker.

† l. c. Vol. XX, p. 285, "Failure of Natural Reproduction in the Teak Forests of the Coimbatore District."

A still more significant fact is the absence of saplings over about eight years old, though there are numerous seedlings and young plants up to that age. Now this observation seems to support the proposition made by Mr. Clutterbuck quoted on page 208, that after a lengthened period of subjection to annual fires, a forest requires a recuperative period under fire-protection before the conditions favourable to natural regeneration can be restored.

It would appear here too that for some twenty-two years fire-protection had no visible result, and that only for the past eight years have these conditions been restored and are gradually improving. It should be noted that improvement fellings and other operations have been started in this block only during the past three years, and have extended only over about one-fifth of the area.

Taking into consideration all the evidence adduced, the following conclusions appear justified :—

I. In all forests fire is harmful, both directly to the growing-stock and indirectly by the removal of the soil-covering, leading to desiccation, lack of aëration of the soil, erosion, loss of nitrogen, destruction of seeds, etc.

II. In certain forests, however, fire-protection unaided by other operations hinders the natural reproduction of the most valuable species, especially in the case of teak forests.

III. Improvement fellings and cleanings on a sufficient scale suffice to establish natural regeneration in the forests referred to.

IV. Fire-protection is essential in—

1. Forests required entirely or principally for the maintenance of the water-supply or for protection against erosion.
2. Forests where natural regeneration is secured or in which artificial regeneration is necessary or preferable.

V. Fire-protection to be really effective must be continuous.

COIMBATORE :
28th February 1912.

C. E. C. FISCHER,
Deputy Conservator of Forests.

PERIDERMIUM CEDRI AS A DESTRUCTIVE FUNGUS.

By R. S. Troup, I.F.S.

The fungus *Peridermium* (*Æcidium*) *Cedri*, Barclay, which produces the characteristic "witches' brooms" on Deodar trees in certain parts of the Himalayas, has hitherto apparently not been regarded as of much importance sylviculturally owing to the mistaken notion that the damage done by it, if any, is so trifling as to be of no consequence. This is quite true in the case of the "witches' brooms" formed on the side branches of trees, which, if few in number, cannot be considered to have any very deleterious effect on the growth of the tree.

Two cases in the Chakrata Forest Division, however, have been observed which tend to show that this fungus is by no means so harmless as is supposed. The first is that of damage done to a young Deodar plantation at Kathian, visited about six years ago. The plantation was about three years old, and it was noticed that several of the young saplings were so badly attacked as to have the appearance of "witches' brooms" growing out of the ground: the leading shoots had been destroyed, and the future of the saplings concerned was undoubtedly doomed. An extensive fungus attack of the kind might conceivably ruin a young Deodar plantation.

The second case observed was even more serious than the first. Last October I had occasion to carry out an experimental thinning in a sample plot at Koti-Kanasar, in a vigorous pure fully-stocked natural Deodar crop of large-sized poles. It was noticed that many of the poles were badly forked and misshapen at the top, and in consequence a number of otherwise promising dominant stems had to be removed in favour of smaller stems whose leading shoots were still intact; the result was a more drastic thinning than would have been advisable under ordinary circumstances. Until the marked trees were felled I was unable to account for the damage, but an examination of the felled stems at once revealed the cause to be an attack of the fungus *Peridermium Cedri*. The illustration (Plate III) shows the top of a Deodar pole affected in this way; another affected shoot on the

Photo-Mechl. Dept., Thomason College, Roorkee. Photo by R. S. Troup.

TOP OF DEODAR POLE ATTACKED BY
Peridermium Cedri.

left has been cut off to make the photograph clearer. Poles attacked in this manner have their height-growth arrested, and are therefore of little further use in the crop: this form of damage is quite extensive in certain localities.

At Bodyar, there is a Deodar tree, some 50 feet in height, attacked by the fungus from top to bottom; it has the appearance of one immense "witches' broom."

Considering the damage which this fungus may cause if it is allowed to spread, it seems desirable to cut off all "witches' brooms" where found on the Deodar and to take advantage of thinnings and fellings to remove affected stems. Such measures should tend to check the spread of the disease.

As regards the life-history of this fungus, little appears to be known. The first sign of the disease is seen in the affected needles being somewhat shorter than the normal length, and curved. About May and June yellow flecks of spores may be seen bursting out on the surface of the needles. In October no spores are visible, but the characteristic form of the affected needles is noticeable; what happens in the intervening months I have not had an opportunity of observing. As the disease spreads, the branchlets assume the congested and stunted appearance characteristic of "witches' broom" growths, the needles gradually drop off, and the branchlets commence to die.

AN ABNORMAL SEASON.

It may be of interest to record that this year, although still early in February, trees have assumed their young foliage where I am now in camp on the borders of East Khandesh in the Indore State. Such a large proportion of the ubiquitous Salai (*Boswellia*) trees are in leaf that the forests look quite green. A great number of teak trees, too, are in leaf, *Anogeissus* also, and others. The mohwa trees have shed their leaves and the crop promises to be a poor one. The Palás or Dak tree does not often blossom much before the "Holi" festival in March, but has this year been noticed in blossom for the past month. There is a

general seeding of *Strobilanthus callosus* (Karai). The Bhils say this shrub seeds once in twelve years. The seed capsules are very oily and sticky, and have a peculiar but pleasant scent.

There has been a magnificent crop of grass in these forests along the Satpuras, which has not only been the salvation of local cattle but has much benefited the people of East and West Khandesh, about 300 lakhs of lbs. having been removed by them.

CAMP CHINNARIA: W. F. B.
February 1912.

EXPENDITURE ON FORESTS IN INDIA.

In connection with the above article which appeared in January's number of the *Indian Forester*, we would draw attention to a paper in the Canadian Forestry Journal "On the cost of Forestry in different countries." The statistics given are instructive and we reproduce them below. The countries dealt with are Germany, France, India and the United States.

What will no doubt strike our readers is the very low expenditure in India as compared with Germany and France, and this is all the more remarkable, when it is borne in mind that in India a very heavy recurring expenditure on Fire Conservancy has to be met, absent to a great extent in Europe.

The conclusion to be drawn from a comparison of cost in the different countries are much the same as our contributor drew in his article in January's number and tend to show that as working becomes more intense and in order to induce larger returns from our forests, expenditure on them must be increased.

"A comparison of expenses in these different countries shows some astonishing differences. Prussia, with its forest of a little over 7,000,000 acres, spends each year about $14,000,000; India, with about 65,000,000 acres (including only reserved and protected forests), spends only about $4,000,000. The United States, with about 168,000,000 acres of national forests, spends only about $3,400,000. If these data are expressed in terms of the amount per acre, it is seen that the expenditure by Prussia is over $1·90

per acre as against that of the United States of about 2 cents per acre. In this connection it must be borne in mind, however, that Prussia did not expend so large a sum on forestry at the beginning of its work of organization. With the development of forestry and the increased demand for timber and the resulting high prices, it has been profitable to use more and more intensive methods and invest greater sums each year in forest cultivation. This is well illustrated in Prussia, which in 1849 spent for regularly recurring expenses about $2,000,000 each year, compared with $12,500,000 at the present time.

In other words, the expense of administration increases with the development of forestry. This is possible only when there are increased returns as a result of the increased initial expenses. This principle is illustrated in Prussia, where the net income has increased from less than $7,000,000 in 1848 to about $14,000,000 at the present time.

To carry out further the comparison of expenditures in the different countries, Prussia spends for salaries, including both administrative and executive forces, 52 cents per acre; France, 38 cents; India, a little over 2 cents; and the United States, a trifle over one cent. The average area in charge of a supervising forester in Prussia is about 10,000 acres; in the United States it is over 1,000,000 acres. While our western forests will not require a division into so large a number of administrative units as those of Prussia the contrast is nevertheless exceedingly instructive.

Although the Prussian forests are already thoroughly organized, nevertheless the work of constructing and extending roads and bridges, dams, etc., is being pushed each year with an expense of over $500,000, and that is about the sum which is now being expended on all kinds of construction work in our national forests. In other words, for construction work, including buildings, telephone lines, etc., Prussia spends about 16 cents per acre and the United States about 3·5 mills. In reality the comparison ought to be reversed, for construction work constitutes an exceedingly important part of the first organization of a forest.

The great yield of timber and large returns in money from the European forests are the result of careful, intelligent forestry. Not only are the forests protected, but they are constantly improved; they are properly thinned to obtain the best possible conditions of growth, and open areas are planted with trees when reproduction cannot be secured naturally. All of this involves expenditure of money. Such improvement work costs in Prussia $1,700,000 each year, or 23 cents per acre. Even in India there is an expenditure of over $173,000 a year for cultural operations. The expenditure in the United States is only about $50,000 for this item, a sum so small that it can hardly be expressed in terms of expense per acre.

One of the great problems in the United States is the training of men to handle the work of the national forests. At the present time the number of trained men available for the administration of the forests is entirely inadequate. The country is fortunate in having private schools which are educating men for federal service. The United States Forest Service is aiding these schools to a small extent, but the total amount expended is probably not over $1,000. This may be compared with $50,000 spent in Prussia, $37,000 in France, and $26,000 in India.

It is obvious from this brief comparison of expenses in different countries that the amount of money spent on the administration of the national forests in this country is exceedingly small, and it is perfectly obvious to any one who knows the conditions that a very much larger amount is required to accomplish the purpose of the people of the United States in managing their Government Forests.

Expenditures for Forestry in Prussia, France, India, and the United States.

PRUSSIA.

(FROM THE BUDGET OF 1908.)

Recurring Expenses :	Amount.	Per acre.
Superior staff	$1,433,590.00	$0.19
Subordinate staff	2,468,901.00	.33
Rents and expenses of offices	870,085.00	.12
Scientific work and education	96,750.00	.013

Recurring Expenses :—(*contd.*)	Amount.	Per acre.
Extraction of forest products	3,082,750.00	.42
Cultural work	1,710,500.00	.23
Construction and maintenance of buildings	598,750.00	.08
Construction of roads, dams, etc.	571,500.00	.08
Land purchase	262,500.00	.04
Administration of communal forests	492,000.00	.07
Other expenses	683,914.00	.09
Total ...	$12,521,250.00	...
Extraordinary expenses ...	1,149,450.00	.16
GRAND TOTAL ..	$13,670,700.00	...
Average ...	...	1.823

FRANCE.

(FROM THE BUDGET OF 1907.)

Recurring expenses :	Amount.	Per acre.
Superior service	$500,000.00	$0.17
Subordinate ,, ...	614,000.00	.21
Service and expenses	145,400.00	.05
Education	37,200.00	.01
Cultural and protection	243,900.00	.08
Construction work	675,200.00	.23
Exploitation	83,000.00	.02
Hunt	15,200.00	.005
Special taxes	420,000.00	.15
Miscellaneous	52,400.00	.02
Total ...	$2,876,300.00	...
Average ...	...	.945

INDIA.

(EXPENSES FOR 1907-08.)

Recurring expenses :	Amount.	Per acre.
Superior staff	$774,884.00	$0·012
Exchange compensation allowance	28,083.00	·0004
Subordinate staff (including rangers, foresters and guards) ...	704,218.00	.011
Office establishments (including contingencies)	347,171.00	.005
Extraction	1,478,176.00	.027
Roads and buildings	287,668.00	.004
Fire-protection	192,596.00	.003
Cultural operations	172,763.00	.003
Live-stock, stores, and plan	169,384.00	.002
Working-plans	28,914.00	.000

Recurring Expenses :—(*contd.*)	Amount.	Per acre.
Rent for leased forests	285,979.00	.004
Miscellaneous	69,660.00	.001
Expenditure on realization of revenue from forests not managed by the Government	7,121.00	...
Forest science and education (including all "A" and "B" charges of forest school)	26,656.00	.0004
Extraordinary expenses	179,664.00	.003
GRAND TOTAL ...	4,138,691.00	.0762

UNITED STATES.

(EXPENSES FOR 1907-08.)

Administration (for the general administration of the Forest Service) ...	$162,703.38
Use (for the use, maintenance, and protection of the national forests) ...	2,363,394.64
Improvements (for the construction and repair of permanent improvements upon the National Forests)	592,169.19
Studies (for studies necessary for the use and protection of the national forests and of other forests in the United States, and to promote economy in the use of forest products and the distribution of their results)	297,840.40
Total ...	$3,416,107.61"

ANNUAL REPORT OF THE DELEGATES FOR INSTRUCTION IN FORESTRY FOR THE YEAR 1911.

The number of students on the books of the Delegacy for Instruction in Forestry during the year 1911 was as follows :—

	Hilary Term.	Easter and Trinity Terms.	Michaelmas Term.
First-year students ...	18	16	10
Second-year ,, ...	30	28	14
Third-year ,, ...	19	19	19
Total ...	67	63	43

The students during Michaelmas Term may be classified as follows :—

	In 1911	In 1910.
Probationers for the Indian Forest Service	15	35
Other students	28	35
Total ...	43	70

The decrease in the total number of students is chiefly due to the reduction in the number of probationers for India from 35 to 15, and partly to the effect which the reduction had on the number of other students.

Of the ten students who joined in October, 1911, there are:—

Probationers for the Indian Forest Service	...		3
Other students	...	...	7
Total	...		10

The Secretary of State for India appointed 5 probationers, but only 3 came to Oxford, the other two having been permitted to study at Cambridge. After another year or two, the number of probationers for India is likely to be raised again to the normal number of 10 a year.

Instruction at Oxford.

The Indian School of Forestry was transferred from Coopers Hill to Oxford in October, 1905, and it has educated up to date the probationers for the Indian Forest Service. The Secretary of State for India, however, has intimated to the University on the 17th March, 1905, that the training of the probationers at Oxford was subject to re-consideration within three years. A Committee was appointed by the Secretary of State in 1908, and on its recommendations he arrived at the following decisions, which were communicated to the University on the 2nd February, 1911 :—

(1) Any University which possesses a Forest School approved by the Secretary of State shall be permitted to train Indian Forest probationers. This shall have effect as regards probationers selected in and after 1912. The Secretary of State is prepared to approve for the purpose the Forest Schools existing at the Universities of Oxford, Cambridge, and Edinburgh.

(2) A course of training in practical forestry in Germany or elsewhere, extending over a period of seven months, shall be imposed upon all probationers.

(3) The studies of the probationers shall be controlled, on behalf of the Secretary of State, by a Director of Indian Forest

Studies, who will arrange for and direct the training in practical forestry, and consult with all Universities where there may be Forest probationers, as to the special studies to be undertaken by them, and as to the examinations or tests of proficiency to be required of them. The Director may also be required by the Secretary of State to give lectures in Indian Forestry to Forest probationers at an approved Forest School.

(4) To enable the Forest probationers who have been selected, or who will be selected in 1911, to complete their training, the annual payments of £395, which are at present made for various purposes at Oxford by the Secretary of State, shall continue to be made to the end of the Midsummer Term of 1913, and then be discontinued ; and for such period the Director shall give lectures in Indian Forestry at Oxford to Forest probationers, and shall discharge all other duties that are at present discharged by the Indian Professor of Forestry at that University, whose appointment shall cease from the date of the appointment of the Director.

Sir W. Schlich's service should have terminated on the 28th February, 1910, under the age-limit fixed by the English Civil Service rules, but at the request of the Secretary of State he continued in office, until a decision as to the future training of the probationers had been arrived at. Accordingly, he retired from the Government Service on the 1st August, 1911, and from the same date Mr. A. M. Caccia, M.V.O., an Officer of the India Forest Service, was appointed Director of Indian Forest Studies.

In the meantime a change had taken place at Oxford. While the School of Forestry commenced with the training of Indian probationers, there were, in the spring of 1911, 35 Forest students who were not probationers for India. The Delegates for Instruction in Forestry, after due consideration, resolved that every effort should be made to continue the School of Forestry at Oxford for the training of students of Forestry including probationers for India ; that it would be desirable to appoint a University Professor of Forestry, and if necessary, to make arrangements for the teaching and supervision of students after August 1st 1911, and that Council be informed of these resolutions. In consequence of this

communication, and as no foundation for a Professorship of Forestry existed, Sir W. Schlich was appointed Reader in Forestry for a period of three years from the 1st August, 1911, and by decree of Convocation he was given the status of Professor of Forestry as long as he holds the Readership. He thus remains Secretary to the Delegates for Instruction in Forestry.

After discussion with Mr. Caccia it was arranged that he and the Professor of Forestry should divide the instruction in Forestry between themselves until Midsummer, 1913. After that date the University will have to make provision for carrying on the School of Forestry without any assistance from the Secretary of State for India. It is hoped that by Midsummer, 1913, means will be found for some foundation for a permanent Professorship in Forestry.

The regulations for the Diploma have been revised, so as to bring them into harmony with the changed conditions, and they will be published during the present Hilary Term.

Practical Course.

Thirty students completed the practical course during the year, and sixteen commenced it.

Examinations.

The usual departmental tests were held, and an examination for the Diploma took place in the beginning of October. Thirty students came up for the final examination in Part II, and all passed. The following received the Diploma :—

Aiengar, Bangalore Rangaswami, Non-Collegiate.
Beeson, Cyril Frederick Cherrington, B.A., St. John's College.
Bourne, Ray, B.A., Trinity College.
Brooks, John Birtwhistle, Christ Church.
Cheyne, George Collie, Christ Church.
Clifford, Maurice William, B.A., Lincoln College.
Cooper, George Milne, St. John's College.
Fairbridge, Kingsley Ogilvie, Exeter College.
Garnett, Noel Trevor, Christ Church.
Gent, John Roland Philip, Worcester College.
Govinda Menon, Kuppakat, B.A., St. John's College
Hargreaves, Charles Kerrison, St. John's College.

Harlow, Christopher Millward, Non-Collegiate.
Howard, Stanley Herbert Wright, B.A., Exeter College
Jones, Owen, B.A., Non-Collegiate.
Mackenzie, John Mitchell Douglas, B.A., New College.
Madan, Framroz Rustomji, B.A., Wadham College.
Marriott, Robin George, B.A., Hertford College.
Milne, William Charles, Non-Collegiate.
Mitchell, John Brine, B.A., St. John's College.
Moodie, Adam Wilson, Non-Collegiate.
Ogilvie, George Hamilton, New College.
Patterson, Christian Bingley, B.A., Keble College.
Power, Walter, University College.
Sothers, Donald Bevan, B.A., St. John's College.
Starte, Horace Wilderspin, B.A., Lincoln College.
Thomas, Alan Robert, Merton College.
Unwin, Richard, Keble College.
Walters, Owen Huth, B.A., Christ Church.

Of the twenty-nine students who received the Diploma in Forestry,

22 joined the Indian Forest Service,
1 joined the Ceylon Forest Service,
2 joined the Forest Service in Indian Native States,
1 joined the South African Forest Service,
1 has returned to Newfoundland,
1 is going to Australia, and
1 proposes working in this country.

The results of the examination in the subjects auxiliary to Forestry were as follows :—

General Botany	...	14 students passed.	
General Geology	...	14	„ „
Forestry Botany	...	23	„ „
Zoology	...	27	„ „

Forest Nursery and Experimental Plantations in Bagley Wood.

The progress has been satisfactory. An additional area of about 8 acres has been prepared, and partially planted ; the rest is being planted at the present time. The total area of experimental plantations amounts now to 23 acres. The effect of a recent fall of snow has been very instructive. The young trees of Douglas

fir, both Oregon and Colorado varieties, as well as those of *Thuja plicata*, the giant cypress, were bent to the ground and had to be lifted up again. All European species, as well as *Picea sitkensis*, were not affected by the fall of snow. In last year's report it was stated that the Douglas fir had suffered from strong winds. All these matters should not be lost sight of when selecting exotic species for planting on a large scale. It is also interesting to note the effect of the exceptionally dry summer of 1911. In the older experimental plots hardly a single plant died. In three experimental plots of quarter-acre each, on a very poor piece of ground, planted in the early spring of 1911, to see which of three species would do best on such inferior land, of the Banksian pines, recommended for localities where nothing else will grow, hardly a single plant died; of spruce, about 30 per cent. died; and of Scotch pine, 60 per cent.

The nursery is fully stocked, in fact, overflowing into an adjoining area. The following plants were sold during the year:—

Douglas fir	17,000
Silver fir	7,000
Larch	12,500
Scotch pine	2,000
Banksian pine	350
Corsican pine	12,000
Sitka spruce	24,000
Norway spruce	7,000
Total ...	81,850

Of these, 26,000 were three and four-year-old plants, and 55,850 were two-year-old seedlings. In addition, a considerable number of plants were handed over to St. John's College. In view of the fact that the payments hitherto made by the Secretary of State will cease after 1913, an effort will be made to cover the cost of maintaining the forest garden and experimental plantation by the sale of plants.

Finance.

The annual accounts, subject to audit by the University Auditor are exhibited in the accompanying statement. The balance at the credit of the Delegacy amounts to £503-13*s* 2*d*

Abstract of Accounts, 1911.

Receipts.	£	s.	d.	£	s.	d.
Balance, December 31st 1910, brought forward from last Account, being Cash at Bank and in hand on General Account	295	5	7			
Deposits for Practical Course on the Continent	634	1	3			
				929	6	10
Secretary of State for India :—						
Annual Grant				395	0	0
Students' Fees :—						
Lectures in Forestry	223	0	0			
Lectures in Geometrical Drawing, Engineering and Surveying ...	210	0	0			
				433	0	0
Deposits by Students towards expenses of Practical Course				837	18	0
Examination Fees				86	0	0
Diploma Fees				60	0	0
Sale of Plants				29	2	0
Grand Total ...				£2,770	6	10

Payments.	£	s.	d.	£	s.	d.
Department of Geology, for instruction of Students ...				100	0	0
Instruction in Indian Botany				46	0	0
Instruction in Organic Chemistry				20	0	0
Instruction in Geometrical Drawing, Engineering and Surveying				155	0	0
Examination Fees paid to University Chest ...				86	0	0
Fees paid for Departmental Examinations ..				13	19	0
Diploma Fees paid to University Chest				58	0	0
Travelling Allowances to Professor and Assistant Professor				37	10	0
Clerical Assistance				112	10	0
Excursions in England				23	9	0
Practical Course on the Continent				1,207	15	11
Wages of Caretaker				65	0	0
Rates and Taxes				23	6	6
Furniture and Fittings				12	5	8
Heating and Lighting				19	10	5
Stationery and Printing				7	17	6
Expenses of Forest Garden				102	19	11
Apparatus and Museum Specimens				14	14	7
Books for Forestry Library				8	13	4
Miscellaneous				21	9	4
Balance, December 31st 1911, carried forward to next Account, being Cash at Bank and in hand on General Account ...	£503	13	2			
Deposits for Practical Course on the Continent	£130	11	8			
				634	4	10
Grand Total ...				£2,770	6	10

Note.—The balance of deposits for the Practical Course should amount to £264-3*s.* 4*d.*, whereas only £130-11*s.* 8*d.* is shown under this head. The difference of £133-11*s.* 8*d.* has been added to the balance of the General Account, because it consists of savings effected during the years 1906, 1907, and 1908, when the probationers paid a fixed amount to the Delegates, the latter meeting all expenses connected with the Practical Course. Since 1909 a separate account has been kept with each student, and any surplus of deposit over actual expenses has been returned to them.

OXFORD :
February, 1912.

W. SCHLICH,
Secretary to the Delegates for Instruction in Forestry.

CHOLERA TREATMENT.

A correspondent writes to us that he has recently addressed Major Leonard Rogers, I.M.S., regarding the most practical manner in which to treat cholera cases following on his recent discoveries. As is well known under the method advocated by Major Rogers, cholera mortality has been reduced to about 23 per cent.

Major Rogers' reply, which will be of interest to our readers, is as follows :—

Medical College, Calcutta, 8th Feb. 1912.

DEAR SIR,—In reply to yours of the 2nd *re* cholera treatment, I write to say that the use of permanganate will doubtless save many cholera patients, especially if begun early, but the injections of salines can only be given by a doctor However, one and a half teaspoonfuls of common salt to one pint water may be given by a layman as a rectal injection every two hours, with great advantage in all but the most severe cases. Bathgate and Co., Calcutta, I believe, now stock keratin coated permanganate pills made by Parke Davis and Co., two of which may be given by the mouth every quarter hour at first and later every half hour, until the stools become green and less copious, and in addition either calcium or potassium permanganate in a solution of the strength of 6 or more grains to the pint may be given to drink as freely as possible.

Yours faithfully,
(Sd.) LEONARD ROGERS.

P.S.—If you are able to try the treatment I shall be interested to hear of your results.

REVIEW.

"JUNGLE FOLK."

(By Douglas Dewar.)

The above is the title of the latest work by that well-known Indian Naturalist, Mr. Douglas Dewar. The book consists of a number of delightful natural history sketches, mostly of birds, which will be read with pleasure by all true lovers of nature. The author who is a keen and careful observer is not satisfied with giving ordinary descriptions of the ways and habits of birds, but discusses the probable origin, the why and wherefore, of their habits.

He has, moreover, a humorous and attractive style which is bound to captivate the reader.

On pages 7 and 8 an attempt is made to defend the Indian song-birds, and a short list is given of a few Indian songsters who, it is said, could hold their own in any company.

So far as the Shama and perhaps also the Magpie robin and orange-headed ground-thrush are concerned, we are ready to agree with the writer, but we are not prepared to class the fantail flycatcher, the white-eye and the purple sun-bird with our English songsters.

There are other Indian songsters, however, mostly, it is true, Himalayan birds whose songs would compare favourably with those of the majority of English songsters, and among these we would mention the whistling schoolboy (*Myiophoneus*), the Pekin robin (*Liothrix*), the verditer flycatcher (*Stoparola*), the ruby throat (*Calliope*), the white-collared and grey-winged ouzels (*Merula. albicincta* and *Boulboul*), the Himalayan gold-finch (*C. caniceps*), and the Kokla pigeon (*Sphenocercus sphenurus*).

On page 116 the author comments on the rarity of green in the plumage of birds, and states that it is apparently a difficult, colour to acquire.

He then goes on to say that the comparatively few birds, such as the bee-eaters, paroquets, barbets, green bulbuls and fruit-pigeons, which have acquired this colouration do not seem to require it for protective purposes, being well able to look after themselves and to be just those who are least in need of such protection.

Here we are unable to agree with him except in the case of the bee-eaters, which are never chased by hawks on account of their activity and small size. We are of opinion that green plumage is of the greatest protective value to all birds, such as the paroquets, barbets and fruit-pigeons which habitually frequent the crowns of trees.

Hawks, and specially the Shahin, are notoriously fond of paroquets, and a paroquet, in spite of his formidable bill and a green-pigeon, in spite of his pugnacity, are both equally helpless in the grip of even a moderate-sized hawk. The same applies to the barbets which are birds of laboured flight, all these species are as nearly invisible as it is possible for a bird to be when sitting motionless in the leafy canopy of a tree and would then almost certainly escape detection from a passing hawk.

When on the wing, both paroquets and green-pigeons, in spite of their fine flying powers, are very liable to the attacks of hawks.

Chloropsis may or may not derive value from his protective suit of green. He is certainly very difficult to see when sitting in his favourite spot, a bunch of "loranthus" near the summit of a tree.

On page 113 it is stated that terns do not appear to do much incubating in the day time, as the eggs are kept warm by the rays of the sun.

We are a little sceptical about this, and are inclined to believe that it is very necessary for terns to cover their eggs throughout the heat of the day, not because the uncovered eggs would get too cold but because they would get too hot, the temperature of a sandbank in the rays of the March sun being well over 100° Fahrenheit; and, moreover, they would be subjected to a *dry* heat which no eggs can stand.

A few small mistakes due to the printer's devil are the following :—

Page 38. For *palabarius* read *palumbarius.*

Page 112. For *rhynchope* read *rhynchops.*

Page 190. For " horizontal " read " vertical".

Having delivered ourselves as above, we heartily commend the book to the attention of all Indian Naturalists and to lovers of Nature among whom may be classed most members of the Indian Forest Department.

PUBLICATION BY THE GOVERNMENT OF INDIA AND LOCAL GOVERNMENTS OF QUINQUENNIAL REVIEWS OF FOREST ADMINISTRATION IN INDIA.

The following circular has been addressed by the Secretary, Revenue and Agriculture Department, to all Local Governments and Administrations :—

SIR,—In this Department Resolution No. 16-F., dated the 7th June 1892, certain dates were prescribed for the submission of annual reports on forest administration by Conservators to Local Governments and for the submission of the orders of the Local Governments on these reports to the Government of India. It has hitherto been customary for the Inspector-General of Forests to combine and publish the statistical information afforded by these reports, and also to publish annually a general review of the forest administration throughout India. It is found, however, that as a rule it is difficult in an annual review of this character to bring out clearly the main points for information, especially in respect of broad matters of forest policy, and the review has hitherto been to a large extent confined to a reproduction in narrative form of the information given by the statistics appended to it. The Government of India have accordingly decided that, while an annual return of statistics relating to forest administration for the whole of India will be published as before, there shall be no annual review of these statistics.

It has, however, been the practice since 1885 for the Inspector-General to publish quinquennially, in addition to his annual review,

a retrospect of the work of the past five years, and the Government of India propose that in future a review of this character shall be published, either by the Government of India or by the Inspector-General of Forests, at the conclusion of each five years. The last quinquennial review having been issued in dealing with the reports for the year 1908-09, the next review of this character will be issued in dealing with the returns of the year 1913-14.

2. The Local Governments will continue to issue their orders year by year on the annual reports submitted by Conservators and Chief Conservators, but I am to request that, if

the Governor in Council
the Lieutenant-Governor in Council
the Lieutenant-Governor
you

has / have

no objection, in the years in which the Inspector-General of Forests or the Government of India issues a quinquennial review, the Local Governments may also, in their orders on the reports submitted to them, take into consideration and review the events and changes of the last five years, and that in these orders they should show, as clearly and concisely as possible, the directions in which their forest policy is tending and the extent to which they have been able to carry out the general principles of that policy as laid down by the Government of India.

3. The reports hitherto submitted annually on the Forest Research Institute and the Forest College at Dehra Dun will be submitted to the Government of India annually in future as hitherto, but in the year in which the provincial reports are reviewed by the Inspector-General of Forests or the Government of India, reports on the Institute and College should also be so arranged as to indicate the progress and changes effected during the preceding five years.

I have the honour to be,
SIR,
Your most obedient Servant,
E. D. MACLAGAN,
Secretary to the Government of India.

THE VALUE OF SAW-DUST.

Only a few years back saw-dust was regarded by owners of saw-mills as so much waste, to be got rid of anyhow, and as quickly as possible. Anybody could have it, and welcome. Some proprietors even paid people to cart it away. To-day all this is altered. Saw-dust, so far from being looked upon as rubbish, is greatly prized and turned to account in a hundred different ways in arts and manufactures.

Sugar, for instance, is made from it. So, too, is alcohol, which is, of course, the basis of all spirits. At a recent banquet, attended by famous chemists from all over the world, excellent "brandy" was served which had been distilled from saw-dust. It was mellow, of agreeable flavour, perfectly free from any odour or taste of turpentine, and none of the guests knew, until they were told, that it was other than the genuine juice of the grape.

Saw-dust, again, forms the basis of more than twenty different kinds of explosives. The so-called "white" and "yellow" gun-powders are merely so much saw-dust saturated with certain acids.

All kinds of dyes are now manufactured from saw-dust, and are both cheap and permanent. A pound of saw-dust dye, for instance, costs only about half as much as the same quantity of logwood extract, while possessing four times the dyeing power.—[*Wood Waste News, U. S. A.*]

OIL FROM GRASS.

A large industry in pressing oil from lemon-grass is now being carried on in the Walwanad Taluk, South Malabar, by some native capitalists who shipped recently oil valued at over Rs. 10,000 to foreign countries, where the oil, it is said, finds a ready market. The lemon grass is in abundance in the Walwanad Taluk, during all seasons of the year.—[*Commerce.*]

USES OF WOOD PULP.

"Wood-pulp is not only valuable as being the principal raw material for paper-making, it is even more valuable when transformed into wood-pulp yarn for weaving purposes, although at present the quantity used is nothing like so great." "Pulping wood," says *The Newspaper Owner*, "for paper-making makes it two or three times its value as timber, but when transformed into yarn a cubic metre of wood worth 3s. becomes worth 45s., or made into artificial silk is worth £7-10s."

Wooden Clothes.—A traveller in Tibet relates that he saw women wearing a garment constructed of wood. Wooden clothes, however, are not likely to be confined to Tibet if the ideas of an American inventor become popular. He has manufactured for himself and wears a fancy waistcoat of pinewood fibre, and looks forward to the time when wooden suits will be generally worn. The wood is, of course, not in its usually crude form—it is first reduced to pulp, then drawn into threads and woven like cloth. Cloth of this kind, it is stated, wears like leather, and is cheaper than the cheapest of ordinary cloth.—[*Timber Trades Journal.*]

POISONOUS WOODS.

A number of woods show in less or more degree during their technical use disturbances of health. Some of these are woods which possess neither odoriferous nor colouring matter, and the opinion that these bodies are the source of the poisonous action is, therefore, untenable. Amongst indigenous woods, the following possess poisonous properties :—*Taxus baccata, Juniperus Sabina, Cytisus laburnum, Rhus tiphina, Rhus botinus,* and *Coriaria myrtifolia.* These, however, are seldom used, and then only in small pieces. Of foreign woods, poisonous properties have been found in *Buxus sempervirens, Hippomane mancinella, Excœcaria Agallocha, Amyris balsamifera, Convolvulus scoparius,* and *Santalum album,* and various satin woods.—J. Grossmann (*Bayr. Ind-u. Gewerbebl.*, 1910, 51 ; through *Jahresber d. Pharm*, 45, 12, 1911).—[*Pharmaceutical Journal and Pharmacist.*]

A NEW USE FOR CACTUS.

A Consular report from Montevideo suggests that the people of the south-western United States, where cactus is abundant, and often a nuisance, might follow the example of the Uruguayans and utilize this plant in making whitewash. When travelling through the rural districts of Uruguay one's attention is attracted by the fine white color of the farm buildings, even during the wet season. The whitewash is made from the sliced leaves of the common cactus, macerated in water for 24 hours. To the creamy solution thus produced lime is added. When applied to any surface, a durable pearly white appearance is produced.—[*Scientific American.*]

THREE MILLION MATCHES A MINUTE.

It has been estimated that, for each minute of time, the civilized nations of the world strike three million matches. This is said to be average for every minute of the twenty-four hours of the day. Fifteen hundred billion is the number for the entire year, and those persons who live under the American flag are charged with the consumption of one-half of this amount.

The importance of the industry which turns out the little splinters of wood tipped with sulphur or some other material ignited by friction, is only recognized when the average smoker tries to contemplate his predicament if he had to go back to the time when he had to coax a spark from a tinder-box. Small and insignificant as it is, the match demands as much attention in the choice of the wood involved in its manufacture as any other forest product. Only the choicest portions of the best trees are suitable. Sap-wood, knotty or cross-grained timber will not do. Instead of being a by-product, the little match is turned out at hundreds of mills over the country where the by-products are bulky objects like doors, sash, shingles, sidings, posts, and cord-woods. The pines, linden, aspen, white cedar, poplar, birch and willow are the most suitable match timbers.—[*Scientific American.*]

BITTER PRINCIPLE OF *ANDROGRAPHIS PANICULATA.*

Andrographis paniculata has a reputation in Java as a remedy for snake-bite. By extracting the leaves with alcohol, a lactone, $C_{20}H_{30}O_5$, has been isolated and named *Andrographolide.* It is converted into salts of andrographolic acid on boiling with caustic alkalies.—K. Gorter (*Apoth. Zeit.*, 1911, 26, 954).—[*Pharmaceutical Journal.*]

CAUSE OF FLOOD FERTILITY.

A new theory of the great fertility of alluvial soil has been brought to the notice of the Royal Microscopical Society by Rev Hilderic Friend. It is usually explained that the fresh soil brought by occasional floods keeps up the richness of the land, but now the real cause is affirmed to be the vast numbers present in the mud deposit of a tiny worm that buries its head and waves its tail above the surface. In some places an ounce of ooze has been found to contain a quarter of an ounce of these worms.—[*Capital.*]

COUNTERFEITING METHODS IN UNITED STATES LEATHER INDUSTRY.

H. M. Consul at Philadelphia (Mr. W. Powell) has furnished the following particulars of counterfeiting methods used in the leather industry in the United States :—

The United States Bureau of Chemistry has recently been investigating various methods employed in the leather industry. It is estimated by the official experts that at least half, probably more than half, of all leather that comes into the market in the shape of boots, shoes, harness, bookbindings, etc., is a counterfeit of what it purports to be. A bull's hide is split into half-a-dozen thicknesses, these being used to counterfeit various kinds of leather, such as kid and crocodile skin. In the shoe trade, leather known as "Box Calf" is made of this split hide, and is largely employed for making boots and shoes of the cheaper grades. Pigskin is also imitated in the split leather ; it is possible to buy false pigskin

leggings at from 12*s.* to 16*s.* a pair. The leather is stamped by a special machinery which gives it the apparent grain of pigskin. Indeed, the little holes from which the bristles have been removed are counterfeited; the imitation may be detected, however, from the fact that the holes are not to be found inside the leggings. The use of stamping machinery has enabled the manufacturer to counterfeit with great accuracy almost any kind of leather, especially when the split bull's hide is used. A very large proportion of the "crocodile skin" bags are of this material. Cordovan leather is least liable to imitation owing to the difficulty of reproducing its appearance.

With regard to the adulterants used on leather, the chief among these is glucose obtained from corn starch, employed to increase the weight. This glucose is sometimes brushed on the leather or added to the leather in a revolving drum. A frequent adulterant is Epsom salts, which is stated to clear the grain and render the material brighter in colour. The treatment, however, is very harmful, destroying, as also does treatment with glucose, the waterproof quality of the leather. The weight of leather may be increased by the application of Epsom salts as much as 12 per cent.

An even worse method of treating leather is to put in an excess of tanning material, comprising tannin and the related compounds of sugar and organic acids. This will often increase the weight of the leather by as much as 20 per cent. The leather is at first fairly water-tight, but constant use soon washes out the superfluous tannin, and the material, which by the treatment is rendered harder and stiffer, is likely to crack and break in the creases.

What is called sophistication is the common practice of bleaching the leather by means of alkalies and sulphuric acid. If, as very often is the case, some of the free sulphuric acid remains in the leather, it has the effect of burning the tissue and causing its disintegration, so that it breaks easily. The acid also makes the material harsh and brittle, sometimes softening the surface, which is easily rubbed off. Alkalies also render the substance of the

leather hard, and easily cracked and broken. The object of this bleaching is of course to improve the appearance of the leather, which, as it comes from the tanyards, is apt to be dark and often blotchy in appearance.

A frequent practice of boot manufacturers in the United States is to put the leather on an emery-wheel, thus scratching off all the grain or outside surface, in order to render the leather more attractive in appearance.

Large quantities of paper are used in the manufacture of boots and shoes of cheaper grades, which are given an outer cover of a mixture of leather scraps and pulp paper moulded into the required shape. This mixture is treated with oil, rubber and glycerine, the last-named ingredient serving to soften it, whilst the others tend to make it waterproof for a certain time.

There appears to be no law in the United States which can prevent the adulterations and manipulations carried on in the leather trade. The Bureau of Chemistry, however, is working to acquire a knowledge that will bring about a more intimate appreciation of the fundamental principles of leather-making. It is endeavouring to find out how to obtain a greater percentage of tannin from the tan bark, and to discover and explain to leather-workers the action of bacteria of the various kinds used in the manufacture of leather. No exact knowledge on these matters has hitherto been attained.

With the growing scarcity of leather, there is much need of a substitute, but no satisfactory one appears to have been produced. Some imitation leather fabrics have been applied to the manufacture of valises and portmanteaux and hand bags of the cheaper kinds. Most of the fabrics are produced by the use of sulphurated linseed and other oils, sometimes with an admixture of a solution of rubber, applied to canvas or cotton cloth ; and they are not suitable for foot-wear.—[*The Board of Trade Journal.*]

CORRESPONDENCE.

TO THE HONORARY EDITOR, INDIAN FORESTER.

SIR,—In the February number of the *Indian Forester* Mr. Milward takes exception to the following passage in the Editorial of November last :—" Even in the short period during which the Research Institute has been in existence, we can cite several instances of progress directly traceable to its efforts. An impetus has been given to the introduction of a more rational system of working our *Sal* and teak forests, a large experimental area having been established to test the applicability of the method of successive regeneration fellings in the former." If this passage appears to belittle the efforts of previous workers in that line, then we must express regret at having unwillingly conveyed any such impression : this was far from our intention, as we are well aware that more rational systems of working *Sal* forests have been talked of for many years past, though the practical results so far have not been very far-reaching.

As regards the Thano experimental area, it is true that the method of successive regeneration fellings was one of the three systems prescribed in the Dehra Dun Working Plan of 1903, but the prescriptions proved unsuitable for the purpose for which they were mainly intended, namely, to afford an object lesson to the students of the Forest School and a demonstration area to test the applicability of the systems in question. It is unnecessary here to mention in detail in what respects the original plan failed : suffice it to say that something more than a " modification " was necessary to affect the desired object, and a totally new plan was prepared for the forest in question, a complete re-enumeration and re-adjustment of areas having been carried out. The whole area is now devoted to the method of successive regeneration fellings, the area allotted under the Plan of 1903 having been found insufficient. We trust, therefore, that Mr. Milward will not grudge the Research Institute a small modicum of credit for its share in furthering the cause of scientific Forestry in this particular case.

" *The writer of the Editorial.*"

SIR,—I have the honour to forward a copy of a letter received from the American Consul-General, No. M.C. 768, dated the 26th February 1912, containing extracts from a communication made to him by the American Forestry Company of South Framingham Massachusetts, on the subject of the sale of Indian Forest tree seeds in case you care to publish the same in the *Indian Forester*.

S. CARR,
for *Inspector-General of Forests.*

Simla, the 14th March 1912.

Copy of a letter from the American Consul-General, to the Inspector-General of Forests to the Government of India, No. M.C. 768, dated Calcutta, the 26th February 1912.

This office is in receipt of a letter from the American Forestry Company of South Framingham, Mass., from which I take excerpts, as follows :—

"We are very desirous of extending our international trade in specially collected tree seeds in the countries where we have not as yet had business relations.

We are already supplying some of the most highly informed and critical State officials in Europe, where forestry is well advanced, but there are still many places where we have no exchange of business as yet, and India is one of these places. We buy as well as sell tree seed in large quantities and we will thank you to refer this inquiry to the proper parties to enable us to get into touch with buyers and sellers of tree seed in India."

Knowing you are interested in this subject, I have taken the liberty of replying to the American Forestry Co. that their letter has been referred to you, and I have to request you to reply to them direct at your convenience.

SHOOTING IN BURMA.

In the beginning of this year I was instructed to go and do markings in the Mahuya and Paunglin Reserves, which lie on the eastern slopes of the Pegu Yomas, and in which the two chaungs the Paunglin and Mahuya take their rise, and uniting, eventually form what is commonly known in Burma as the Pazundaung creek. When I arrived at my destination, the villagers round about came and gave me thrilling accounts of the many tigers and elephants which roamed about the surrounding forests. As the latter class of animals may not be shot except under certain conditions, and as I had never shot a tiger and was very anxious to do so, I gave all my spare attention to the former class. I tried again and again to purchase a buffalo or cow-calf to put out as a bait, but the villagers refused to sell me even one. I was thus forced to rely on the chance of finding a kill of a wild animal in the forests. I was rather lucky in this, as, about three weeks after I had arrived, one of my men one morning came upon the body of a sambur stag which had been killed by a tiger on the previous day. In the course of the day I had my *machān* erected on a conveniently situated tree and at about 4-30 P. M. I started off for the kill accompanied by two Burmans. When I arrived there, to my great surprise I came face to face with the tiger having its meal. However, before I could get a shot, stripes was off. I felt inclined to return to my camp, thinking that the beast would not come back that evening, but acting on the advice of my Burmans, I changed my mind and went to the *machān* followed by my men. We had hardly been seated for half an hour, when I saw the huge cat coming stealthily along towards the kill, taking cover most carefully for about four or five seconds behind every bush it came across. As it approached nearer and nearer to the kill, I gradually brought my rifle up to the present, and as soon as it came into the open near the carcass, I aimed for its heart and fired. As soon as I had done so, the beast gave a wild jump, let out a loud roar and rolled over. At first I thought it was dead, but after a short time it got up and disappeared from sight into the thick undergrowth. As it was getting dark by then I

decided not to follow up the wounded animal, but returned to camp as soon as possible. The next morning, accompanied by almost all the villagers who having heard of the affair had early flocked to my tent, I went in search of the tiger. When we came to the site to my great astonishment I found that the kill had been dragged during the night. This could mean either I had not mortally wounded the tiger or else there was another animal feeding on the kill. The first supposition was soon dispelled, for we soon after struck the trail of blood and found stripes lying cold and stiff in a chaung close by. It was a tigress I had shot, and it measured 8 feet 6 inches. The bullet had gone clean through its body, and it must have died shortly after we had quitted the *machān* the evening before. The Burmans and Karens then told me that its pair must be the animal which had dragged the kill during the night. I immediately had another *machān* erected and went off to work. I went out to the kill that evening at about 3-30 P.M., but when I arrived there I found that the body had been dragged again by the beast during the day. To enable me to see the carcass clearly from the *machān*, I had the place around it slightly cleared, but whether this cutting frightened the animal or not, nothing turned up that evening, although I sat up till it was too dark to see. The tiger, or whatever it was, came, however, the same night and dragged away the kill again. I had another *machān* erected near the new spot and sat up again that evening. When it was almost dusk, to my great surprise, instead of a tiger a huge black bear shambled out from the undergrowth and started eating at the carcass. I soon settled him with a shot through his breast. I then naturally concluded, that it must have been the bear that had dragged the body of the deer the day before. But the Burmans and Karens would have it that it was a tiger and even showed me fresh pug marks of the huge cat. They also solemnly stated that the tiger had not come because it was afraid of the bear, and that it would come again now that the latter was dead. I may here state that when I was skinning this animal the villagers were very keen on getting hold of a part of the intestine they called the *the-gay*. I do not know exactly what organ of the bear's body

it is, but it was considered very valuable as a medicine by the people, and one villager even offered me Rs. 5 for it. He was greatly surprised when I declined to sell it to him but gave it away *gratis* to the man who had helped me most in the shoot. Well, to revert again to the kill, I found the next morning that it had been dragged yet again, and I was thoroughly astonished. In the evening I sat up again on a newly-made *machān*, but it was in vain as nothing appeared. The next evening, however, I was more fortunate, but again, instead of the expected tiger, another black bear came to the kill, and I easily disposed of him. Over the same kill I sat up after this for two more evenings, but I did not see anything more. By the end of that time the carcass had become putrid and had almost all fallen to pieces. I was exceedingly pleased at my good luck, as I have been little over seven months now in Burma.

A. J. BUTTERWICK,
E. A. C., Forests.

TURPENTINE AND ROSIN MARKETS.

TURPENTINE.

Messrs. James Watt & Son report as follows :—The persistent rise during 1910 increased in intensity until late in March 1911, when record quotations since the war of secession were registered for American spirits, *viz.*, 107c. per gal. in Savannah ; 74*s.* 3*d.* per cwt. in London. Dear turpentine during the early months of 1911 was a corollary of the two poor crops of 1909 and 1910 ; but the above prices were certainly unduly inflated ; the trade, on both sides of the Atlantic, strongly resented them ; the upshot was a larger use of substitutes than has ever been known. This popularity of substitutes, and the larger crop in America, brought about a remakable fall, *viz.*, from 107c. in March to 44¼c. in November in Savannah, and from 74*s.* 3*d.* in March to 33*s.* 9*d.* in November in London. The rapidly increasing production in America of high grade turpentine made from pine stumps is attracting considerable attention ; it has found such a ready market

in the United States in 1911, that the supply in 1912 will be vastly increased. Towards the end of 1911 we received sample shipments of this stump turpentine to London, which met with a flattering reception, and the import to the United Kingdom in 1912 bids fair to be on a large scale. In view of the rapid rate at which the eligible pine forests in the United States are disappearing before the lumberman's axe, whereas the demand for turpentine by varnish and paint makers is constantly growing with the increase of population and wealth of the world, we look upon the advent of this stump turpentine as a great boon, because by broadening the base of supply it will tend to give greater stability to prices. Such fluctuations as those noted above cannot but be detrimental to the trade. There is, probably, ample room for both gum-distilled and wood-distilled turpentine on the markets of the world.

HIGHEST AND LOWEST TURPENTINE PRICES IN LONDON.

	1909.		1910.		1911.	
January ...	28/9	30/9	40/6	43/3	56/—	57/9
February ...	27/3	30/—	41/—	42/9	57/9	63/6
March ...	26/—	27/—	41/6	42/9	63/3	74/3
April ...	25/6	28/—	42/—	44/3	62/—	71/—
May ...	26/6	29/3	42/9	44/9	46/—	64/—
June ...	28/—	32/9	42/6	44/9	43/—	48/—
July ...	33/9	36/—	45/—	50/6	37/6	39/—
August ...	36/—	41/—	48/9	51/6	36/6	39/9
September ...	39/9	43/3	51/3	54/6	38/—	39/4½
October ...	40/6	42/9	53/3	56/—	35/—	38/3
November ...	39/9	41/—	54/—	55/9	33/9	35/9
December ...	38/6	40/9	53/3	56/—	35/9	37/6

The average price of American turpentine in London was :— 1905, 45*s.* 7*d.*; 1906, 47*s.* 3*d.*; 1907, 44*s.* 3*d.*; 1908, 31*s.* 9*d.*; 1909, 33*s.* 11*d.*; 1910, 47*s.* 8*d.*; 1911, 47*s.* 9*d.* (The average for 1891-1900 was 25*s.* 2*d.*; for 1909-10 was 39*s.* 4*d.*; for 20 years 1891-1910, 32*s.* 3*d.*)

The total exports from France were (in tons of 1,000 kilos.): 1905, 12,214; 1906, 12,922; 1907, 9,754; 1908, 9,212; 1909, 9,220; 1910, 10,954; 1911 (11 months), 9,207.

The total exports from United States were as under :— 1905-06, 49,482 ; 1906-07, 47,181; 1907-08, 54,800 ; 1908-09, 61,093; 1909-10, 46,747 ; 1910-11, 44,835 ; 1911 (April to October, seven months), 37,717. The American crop year begins April 1st and ends March 31st ; 320 American gallons, calculated as one English ton, equal 1,016 kilos.

TURPENTINE IMPORTS INTO GREAT BRITAIN.

From—	1906.	1907.	1908.	1909.	1910.	1911.
United States ...	19,960	19,593	25,184	18,298	18,264	18,181
France	1,535	989	1,291	1,020	1,138	1,183
Spain and Portugal ...	...	...	327	69	339	260
Russia and Scandinavia	4,139	4,910	1,849	2,752	3,777	4,344
All other Foreign Countries ...	8	23	33	30	94	38
Tons of 1,016 kilos ...	25,642	25,515	28,684	22,169	23,612	24,006
Percentage from—	1906.	1907.	1908.	1909.	1910.	1911.
United States ...	77·84	76·78	87·79	82·54	77·35	75·73
France	5·99	3·88	4·50	4·60	4·82	4·93
Russia	16·14	19·24	6·45	12·41	16·00	18.10
All other countries ...	·03	·10	1·26	·45	1·83	1·24

STOCKS OF TURPENTINE IN LONDON AT THE END OF EACH YEAR.

	1906.	1907.	1908.	1909.	1910.	1911.
American (barrels) ...	18,467	24,614	45,912	26,735	20,488	24,686
French (,,) ...	2,544	1,051	4,601	3,680	2,559	1,569
Spanish (,,) ...	...	...	636	290	956	276
(,,) ...	21,011	25,665	51,149	30,714	24,003	26,531
Afloat	800	7,750	600	3,500	2,100	14,188
Barrels	21,811	33,415	51,749	34,214	26,103	40,719
Price in London ...	50/3	32/3	29/3	40/6	56/-	37/4½
Price in Savannah ...	67½c.	40½c.	38⅝c.	56c.	77c.	50¼c.

ROSIN.

The price of common strained rosin, like that of turpentine, soared to record heights in the spring of 1911, but the subsequent reaction of the former was much less severe, as a glance at the table will show. The year closes with common strained at 17*s.* ex wharf, London, and ·7 at Savannah ; against 14*s.* 9*d.* ex wharf, London, and 5·90 at Savannah, end of December, 1910; against 10*s.* 3*d.* ex wharf, London, and ·4 at Savannah, end of December,

1909. The extension of the cup system of tapping the pines in the United States means a smaller yield of dark grade rosin, and it is the darker grades that are most in demand. We, therefore, see the prices of finest and dark rosins tend more and more to approximate. One of the new processes of wood distillation produces a fine clean ruby rosin; late in the year 1911 we imported to London some of this stump rosin, which has given great satisfaction to those who have tried it; like the stump turpentine, it promises to be a valuable and much needed adjunct to the supply but the quantity produced is relatively small. The Customs Board of New York has not yet made the final pronouncement on the question of the duty on rosin imported to the United States. It will be remembered that the decision of the Court of Appraisers in October, 1910, was in favour of the repeal of the duty. It is the appeal against this decision which is now *sub judice.*

AVERAGE MONTHLY QUOTATIONS OF STRAINED ROSIN.

Price per cwt. = 50¾ kilos. ex wharf, London.

	1906.	1907.	1908.	1909.	1910.	1911.
January ...	9/7½	10/6	9/6	8/3	10/4½	15/9
February ...	9/6	10/9	9/7½	8/4½	10/9	17/3
March ...	9/9	10/10½	9/6	7/10½	10/7½	18/9
April ...	9/9	10/10½	9/6	8/—	10/9	19/3
May ...	10/1½	11/—	8/4¼	8/1½	11/—	17/3
June ...	10/1½	10/10½	7/10¼	7/9	12/—	16/—
July ...	9/9	10/7½	7/10½	8/—	14/—	14/6
August ...	10/—	10/6	7/4½	8/4½	14/6	14/7½
September ...	10/3	10/6	7/1½	9/4½	14/9	15/6
October ...	10/4½	10/3	7/4½	10/2	15/1	15/6
November ...	10/4½	9/9	7/9	10/1½	14/9	15/4½
December ...	10/3	8/9	8/3	10/—	14/8	16/1½
Average of year ...	10/—	10/5	8/4	8/8	12/9	16/4

Total exports of rosin from France (in tons of 1,000 kilos.) :— 1906, 37,888; 1907, 37,931; 1908. 49,230; 1909, 57,234; 1910, 55,751; 1911 (11 months), 64,608.

The total exports from United States were (in tons of 2,240 lbs. = 1,016 kilos, net weight) :—1905-06, 241,243; 1906-07, 270,990; 1907-08, 277,707; 1908-09, 229,336; 1909-10, 209,934; 1911 (seven months, April—October), 152,158. The American crop year begins April 1st and ends March 31st.

ROSIN IMPORTS INTO GREAT BRITAIN.

	1906.	1907.	1908.	1909.	1910.	1911.
From—						
United States ...	66,043	66,295	55,989	50,310	48,381	50,089
France	11,793	11,780	19,056	14,610	16,987	13,250
Spain and Portugal ...	3,816	4,607	6,440	5,298	8,160	8,644
All other countries ...	884	126	641	781	1,503	2,288
Total tons of 2,240 lbs. (1,016 kilos). ...	82,536	82,808	82,126	70,999	75,031	74,271
Percentage from—						
United States ...	80·02	80·06	68·18	70·86	64.48	67·44
France	14·28	14·23	23·20	20·58	22·64	17·84
Other countries ...	5·70	5·71	8·62	8·56	12·88	14·72

Spelter (from the circular of Henry Murton & Co.)—The output of spelter from Europe, Australia and the United States for 1911 and 1910 was as follows :—

	1911. Tons.	1910. Tons.
Belgium	192,000	169,900
Holland	22,400	20,600
Germany—East	153,700	138,000
,, West	92,700	86,100
Great Britain	65,900	62,100
France and Spain	63,200	58,200
Austria and Italy	13,700	13,100
Poland	9,500	8,500
	613,100	556,500
Australia	1,000	500
United States	263,300	246,700
Total ...	877,400	803,700

The total production of spelter thus shows an increase of 73,700 tons, Belgium being the principal contributor to this result. The imports of spelter into England decreased by 5,900 tons last year. The average price of the metal in 1911 was £25 3*s.* 2*d.*, an advance of £2 3*s.* 2*d.* on 1910 and the highest since 1906, when the figure was £27 1*s.* 5*d.*—[*The Indian Trade Journal.*]

NOTES.

Coimbatore Forest School.—We understand that the Madras Forest School will be opened in July instead of in February as originally intended. This will meet a long-felt want in Southern India. Teaching work is not generally popular with Forest Officers, and in order to attract the best men, we trust that speclal allowances will be given to the staff as is the case at Dehra Dun.

Madras Provincial Camp at Delhi.—An officer of the Madras Provincial Forest Service was selected as Assistant Camp Officer on the occasion of the Coronation Durbar, Mr. K. R. Venkataramana Iyer, and from what we have heard his work in this connection gave every satisfaction.

The Inspector-Generalship of Forests.—The opinions of Local Governments have been invited on the question of retaining this post. We have little fear as to the result, as it appears to us incredible that the post of Forest Adviser to the Government of India can be dispensed with, looking to the vast and varied interests involved. It is not generally recognised that nearly 25 per cent of the area of British India is under the control of the Department, while Native States are now showing an increased interest in forestry and constantly seeking advice on the subject.

Investigation into Pulp suitable for Paper.—Mr. Raitt, the pulp expert, has completed the term of his deputation to the Research Institute at Dehra Dun; there are, however, various grasses awaiting examination which he has not had time to complete. There is every prospect of his returning to Dehra to do this, however, as the Government of India, looking to the importance of the subject, has, we believe, offered him a handsome honorarium should he complete the work on the principal grasses by next cold weather.

Final Examinations at the Forest College, Dehra Dun.—The list of students who gained the various certificates at the College examinations is unavoidably postponed till our June issue.

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FORESTRY IN NATIVE STATES.

A perusal of the annual reports of some of the Native States has left an impression on our minds that is not altogether pleasing. The prevailing tone too often seems to indicate a kind of "inertia", the spirit is willing, but the power behind it is at times insufficient to drive through the reforms that in one shape or another seem to be called for. Nor is this to be wondered at. The Conservators are not so well paid as a rule, nor have they the same standing as in British India, and consequently do not carry the weight with the Indian Chiefs and their Durbars that we should like to see. They are further greatly handicapped by their establishments, or often by the want of such, and find it difficult to induce the Durbars to see things in the same light as they do. Durbars are somewhat timid as regards spending money, especially if they are doubtful as to any immediate return ; they are also liable to have too little confidence in the proposals made by their Conservators. All this points to the need of a supervising and advisory force behind the Conservator which will, on the one hand, prevent the acceptance of any ill-considered line of action that may be suggested by him, and

on the other, convince the Durbar of the expediency of accepting well-thought-out proposals bearing on their Forest administration The Political Department may be unable to render any efficient aid in the matter, since its officers are not seldom ignorant of the lines of Forest administration, although in many cases entirely sympathetic and much interested in Forestry and aware of the benefits that a well-considered policy confers on the people.

Our remarks must not, however, be taken to be of universal application, since in somewhat isolated instances, *e.g.*, Kashmir, Mysore, etc., forest administration has been placed on a firm basis and the forest resources of these States are being efficiently looked after. but we are afraid that in the majority of cases this is doubtfully the case. The question then which we wish to bring forward is how to remove the "inertia" that often undoubtedly exists, how to assist well-meaning and often efficient Conservators, how to inspire Durbars with the confidence that proposals put before them for improving forestry in their States are on the right lines, and how to assure them that if they put down money with a view to the development of their Forest policy, this expenditure will be fully justified and a watchful eye kept on it by Officers in the highest degree qualified to advise them. It is of no use proposing that highly-paid Officers from the British Service be deputed to each State as Conservators, the smaller States are not always in a position to pay their salaries, nor probably are Officers available, while many able British and Indian Officers already in the service of the Native States would feel that an unmerited slur had been cast on their capabilities.

Our proposal is that the services of experienced Officers of the British Service should be lent to groups of States. Such might be termed their Consulting Conservators. If this were done the States would have to be grouped, possibly one group might comprise those in the Central India Agency, another those in the Rajputana Agency, and so on. The salary of each such officer might be divided up by mutual agreement among the various States benefiting by his advice and would thus form a comparatively small charge on any individual State, and one that it would

not be difficult to meet. We believe that such appointments would be welcomed by the Indian rulers and by their Conservators and would be of immense benefit to the various States concerned. A Conservator in a small State is much handicapped by want of experience outside his own particular charge and would no doubt be glad of advice from an independent and competent source. A Durbar might be doubtful about accepting proposals made by its Conservator; if, however, an advising officer of mature experience could show that the proposals were sound and had borne good fruit elsewhere, it should not be difficult to convince the Durbar of the advisability of adopting them in its own interest.

Native States, moreover, often have difficulty in obtaining trained Officers: the Dehra College is full to overflowing, and generally cannot meet their applications, while trained men who offer themselves for appointments are too often the lame ducks of the British Service. Besides, such States are out of touch with the Dehra College and Institute and naturally find it impossible to keep pace with the improvements in Forestry that are gradually showing themselves in British India, they feel themselves neglected and not without reason; they have been invited to pursue an enlightened forest policy, and when they try to do so they find themselves discouraged by want of trained officers and the impossibility of obtaining such, by want of advice and by want of sympathy generally. We believe that all this can be obviated by the deputation of Imperial Officers to fill appointments of Consulting Conservators to groups of States, and that by this means not only could schemes yielding, among other things, increased revenue for the present and still larger increase in the future be initiated, but the forest policy of the empire would be consolidated and intimate relations be established between forestry in British India and Native States, to the mutual benefit of both. We should like to see Native States sounded on the subject through their Political Agents and a test group of States formed with its Consulting Conservator chosen for his tact and breadth of view. There are no doubt officers well suited for such a post, but the selection would have to be very carefully made, as we are sure

it would be, and the new departure considered in the first instance as tentative only. We cannot but think that if the Government of India were approached on the subject by a Native State or States, their representations would receive a sympathetic hearing and be likely to be favourably considered, and to Conservators in Native States we put forward the suggestion that they should encourage their Durbars to move in the matter.

As a precedent, we believe that the British Government lends to groups of States officers of the Public Works Department as Consulting Engineers, who, while refraining from interference with the State Engineers, carefully supervise all projects involving any considerable expenditure and whose advice is thoroughly trusted by the States concerned. Why should not a similar course be pursued in the case of the Forest Department? It seems to us that there is every reason why it should.

PRIZE-DAY AT THE IMPERIAL FOREST COLLEGE, DEHRA DUN.

The 1st April was observed as the Prize-day of the Dehra Dun College.

The Hon'ble Sir Robert Carlyle, K.C.S.I., presided, and seated on either side of him were the Inspector-General of Forests and the President of the College. On the platform several ladies were present, among whom were Lady Carlyle and Mrs. Beadon Bryant, as also Mr. Holms, C.S.I., the Commissioner of the Meerut Division, Mr. Oakden, the Superintendent of the Dun, and the staff of the Institute and College.

Mr. Holms, at the request of the President, opened the proceedings by presenting to Mr. Nand Mal, Extra Deputy Conservator of Forests, attached to the Research Institute and College, on behalf of His Honour the Lieutenant-Governor of the United Provinces, the "Sanad" of the title of *Rai Sahib*, bestowed upon him at the time of the Coronation.

The President then read his report on the working of the year ending up with a few words of advice to the students. We print this below :—

SIR ROBERT CARLYLE, MR. BEADON-BRYANT, GENTLEMEN :

I have once more to read to you the report on the work of the College, the final examinations of the 1910-12 class having been just completed.

The year has been somewhat uneventful. I am inclined to think that though the outgoing class undoubtedly claims some good and promising men, yet the average is hardly up to what it has been in the past and that it contains many men of moderate calibre only, and of very medium education, nor am I satisfied that in several instances the application and industry of individual students has been of the highest merit. It seems to me rather that some students, knowing that they have been promised a post under the British Government if they obtain the Higher Standard certificate, and feeling fairly certain of obtaining this, have not exerted themselves as they might have done. Some students have no doubt done themselves full justice and worked especially hard, while one of these, Parkinson, has shown an aptitude for drawing that I have not seen equalled at Dehra, and has, I am glad to see, passed out with honours.

Seven students have obtained the Honours' certificate,

Thirty-one have obtained the Higher Standard certificate,

Twelve have obtained the Lower Standard certificate,

while there have been no failures. This shows the class to be of unequal merit to which must, as I have said, be added want of application on the part of individual students. Still I think that most have learnt the elements of forestry and the kindred sciences, while at Dehra, and what I also regard as of great importance, all have learnt habits of discipline and obedience to authority ; there have been few irregularities and the conduct of the class has been satisfactory and even praiseworthy. Among the objects aimed at at Dehra is the physical development of the student, and few will deny that this is as it should be ; a weak,

physically incapable lad is of little use in our Department. We thus do our best to encourage sports and games of all sorts, and the Government of India, in order to show the high value they place on physical fitness, make an annual grant of Rs. 250 to our athletic club, while Sir Robert Carlyle has offered a valuable prize to a student showing great promise as a forester, and who has been equally good at sports and work, and the Inspector-General has as usual presented a valuable silver cup for the best athlete. The athletic attainments of the College have been on a high level during the past year. The hockey team lifted the Mussoorie hockey challenge cup from 13 competitors and throughout the whole tournament had only 2 goals scored against them, while the football team, though failing to annex the John challenge cup was a good one, and with greater combination and less assurance that they were going to win, would, I think, have succeeded. The College athletic club was joined by nearly every student and the entries for the various events in the sports just held indicate how popular it was.

All non-Indian students joined the Volunteers, and I am given to understand that the Inspecting Officer at the annual camp-of-exercise was specially pleased with the Forest troop. It must, however, be noted that its efficiency was rather due to the exertions of Captain Troup, who unsparingly gave up his time and money to seeing that the students were well instructed, and took especial pains with them, than to the efforts of the students themselves. Next year, I may say, that I expect greater keenness in turning up punctually at parades and in securing general efficiency, and intend to place all students under the immediate charge of one of their instructors who will attend all the parades and the camp-of-exercise, and report to me any shortcomings, thus relieving Captain Troup of a good deal of work. I wish it to be widely known that men who join the Volunteer Corps are expected to do their best and to set an example to other corps in India, and not shirk work. At the request of the Colonel Commanding, I allowed 15 Volunteer students to attend the Delhi Durbar in charge of Captain Troup, who informs me that two of them, Shrigley and

Turner, both third year men, proved themselves well above the average and earned his special commendation ; of some of the others his remarks were, I am afraid, not so complimentary. The Indian students, as usual, were drilled twice a week by the Havildars kindly lent for the purpose by the 2nd K. E. O. Gurkhas, a College officer being always present.

The year was moderately healthy. Fever was at times somewhat prevalent, but there was no epidemic of any sort. I regret to say that I have lately heard of the death of one of the third year students, Dhyan Singh, who was sent to his home on leave on account of continued malaria. He passed through the Ranger's course with honours last year, while another student, Lobo, has been prevented by illness from appearing at the Final Examination. The Board of Control, however, in the exercise of its discretion, has shown its sympathy with his misfortune by granting him the Honours' certificate, which he would have assuredly gained had he been in good health.

The comfort of the students was well looked after. A new lavatory with water laid on was built, equipped and opened during the year, while the whole of the conservancy arrangements of the College, which were giving cause for complaint, were overhauled and placed upon a much more sanitary and satisfactory basis. Two dining halls were built for Hindu and Mohammedan students, while new stone masonry quarters on a fresh site were erected for the College menials outside the compound, the old ones, which were very insanitary, being pulled down. I may thus say that I consider that we have done everything possible for the instruction, both mental and physical, of the students, as also for their comfort, and I take this opportunity of thanking the Research Institute and College Officers who have ungrudgingly given me their support. I should like also to express my gratitude to the Conservators, the Divisional and other Officers of the Province for their assistance freely given, especially on the College tours. Without this we should have been much hampered. Our acknowledgments are also due to Mr. Eccles, Superentendent, Trigonometrical Survey, for having kindly lent the services of Mr. Bell, R.E., to conduct the

Final Survey Examination, which, the Board of Control considers, has been most ably carried out.

And now I wish to address a few words to the outgoing students. As you have gathered, I am not entirely satisfied with the application and industry shown by several men. You are aware the Provincial Service will in future be entered direct from Dehra or by the promotion of Rangers, several of you who are starting as Rangers have, no doubt, hopes of obtaining this advancement. I may, however, say at once that unless Rangers have done their very best and shown marked ability and good work well above the ordinary standard, it seems to me that Conservators are unlikely to consider themselves justified in recommending their promotion, since, in what is to all intents and purposes, a newly-created and well paid service, the Government of India expect to find men of high ability, unblemished conduct and of good standing, and if you fail to show these qualities, the reason for your promotion ceases to exist. I have no wish to decry the capabilities of the existing Provincial Service, many members of which are excellent officers; but in future it seems probable that the standard of attainments that we propose to work up to in this service, will have to be on a somewhat higher level, and more commensurate with the pay offered. Thus, if Rangers have not these attainments, their hope of promotion must rest almost solely on the excellence of their work. I trust that you will bear this in mind and realise that a man who only shows average ability and work, that is, nothing out of the common, is hardly the man we require. Most of you will have your chance, take care that you do not throw it away. Finally I would add, that the President of the College has probably more opportunities than any one else of watching the careers of past students, and few things afford him greater pleasure than to hear Conservators praising the work of Dehra Dun men, thus appreciating the efforts made here to impart a sound and practical education.

With most of you my relations have been most happy, and many of you I should have been glad to have had longer at Dehra, appreciating the manly and sturdy characters that you possess, but

it is time for you to return to your provinces, and in saying good-bye, I wish you all successful careers, and many years of life, merely asking you to remember that if any of you have the opportunity of re-visiting Dehra, I will be very pleased to see you.

The names of the students to whom certificates had been awarded by the Board of Control were read out by Rai Sahib Nand Mal. They were as follows :—

HONOURS' CERTIFICATES.

1. Kartar Singh.
2. C. E. Parkinson.
3. Sheo Nath Koul.
4. J. D. Rego.
5. Yar Mohomed Khan.
6. K. G. Belliappa.
7. C. A. J. Lobo.

HIGHER STANDARD CERTIFICATES.

8. Lekh Chand.
9. Ram Chandra Bhattacharyya.
10. G. V. Trivedi.
11. Salekhu Ram.
12. G. J. Ramchandani.
13. K. D. Sathaye.
14. R. B. Finney.
15. G. K. Murphy.
16. P. Mathuramuthu Pillai.
17. D. C. McDonald.
18. Robindra Nath Mozumdar.
19. Saiddudin Ahmed.
20. C. Sankunni. B. R. Salisbury.
22. Mahesh Saran Raturi.
23. Bhawani Pershad Kosakia.
24. Sarat Kumar Mukerji.
25. Udey Singh.
26. D. J. Monro.
27. Khushi Ram. C. B. Lafrenais.
29. Hira Singh.
30. Jogesh Chandra Chakravarty.
31. Ram Nath Sharma.
32. C. Mohany.
33. K. P. Benjamin.
34. Allahyar Khan.
35. Shib Chandra Chatterjee.
36. P. Burnside.
37. Bishan Singh.
38. Brij Lal.

LOWER STANDARD CERTIFICATES.

39. Syed Ejad Ali.
40. Abidur Rahman.
41. Sukh Narain Khanna.
42. Mir Abul Hasan Kirmani.
43. Ram Narain Joshi.
44. Brahma Nand Sethi.
45. I. O. Mayall.
46. Mul Singh.
47. Rai Singh.
48. Kishisseri Chaikku.
49. Jayanand Nautyal.
50. V. Hariharshankar Desai.

When the certificates and gold medals for "Honours" students had been distributed by the Inspector-General, the prizes were handed to the successful students by Sir Robert Carlyle. We print below the prize distribution :—

SILVER MEDALS.

1. The best student of the year	... Kartar Singh.
2. The best student in Forestry	... J. D. Rego.
3. The best student in Botany	... Kartar Singh.
4. The best student in Engineering	... C. E. Parkinson.

PRIZES.

William Prothero Thomas Prize for the best student in practical Forestry ...	... C. E. Parkinson.
Campbell-Walker Prize for the best Madras student in Forestry ...	... K. G. Belliappa.
McDonnell Memorial Medal for the best Punjab or Kashmir student ...	... Kartar Singh.
Hill Memorial Prize for Sylviculture	... Kartar Singh.
Fernandez Gold Medal for the best student in Utilization	... Kartar Singh.
The Hon'ble Member's Prize presented by the Hon'ble Sir Robert Carlyle for a student generally good at work and sports, and giving promise of becoming a thoroughly good practical Forest Officer ...	... R. B. Finney.
The Inspector-General's Prize presented by Mr. F. Beadon-Bryant for the best athlete among the out-going students...	... D. C. McDonald.
Brandis' Prize for the best article on Practical Forestry published during the year by a past or present student of the College, Rs. 100 ...	To Rao Sahib M. Rama Rao for his Forest record on "The Host Plants of the Sandal Tree."

Sir Robert Carlyle then addressed the students as follows :—

"It has given me much pleasure to be able to attend this meeting and to give away the prizes.

While it is satisfactory that the proportion of Honours' men is fairly high, there is too large a proportion of men who have only got a lower certificate, and I regret to observe that the President has found reason to complain of a certain amount of slackness among some of the students, both in the class work and in their volunteering.

November next will see the opening of the new separate course for the Provincial Service and this should mark a great step in advance. It will now be possible to give a more advanced training to men who are fitting themselves for the higher posts in the Forest Service. On the other hand, the Ranger classes will also benefit as they will be smaller, and it will be possible for the Instructors to give more individual attention to their students. The College is very fortunate in its President and staff, and I hope that under the new system all students will recognise how fortunate they are in working under a President, who is so devoted to their interests, and who with the help of a first-rate staff has done so much to further the interests of Forest education in this country.

I have much pleasure in congratulating the prize winners. They have all shown promise for the future, but they must remember that sustained effort will be required if the promise is to be fulfilled hereafter. The great majority of the students who have to-day received certificates have learned enough to do useful work in the forest, and those who are about to enter Government service will, every one of them, have opportunities of showing themselves to be capable and useful officers of the State, and some will have opportunities of doing really brilliant work, as I firmly believe we are on the eve of a great development of our forest resources. I believe that the men now about to enter the Forest service will, before they retire, see our forests fully opened out forest industries at work on a large scale and our forest revenue multiplied many times over. Some of the students now leaving College may be posted to places where the development of revenue

is not so important as the supply of timber and grazing for the benefit of villagers. In such tracts many important and interesting problems have not yet received their final solution.

Remember always, students, wherever you may work and whatever the capacity of any individual, he will do valuable work if he is invariably courteous, considerate and of strict integrity in his dealings with all with whom he comes in contact. Such an officer can do much to diminish the friction which inevitably exists in countries where forests are coming under protection. I will only in conclusion congratulate those who have selected a career in the Indian forests on their entering a service where the prospects of rapid development are so great—a development in which any man of capacity and energy may play a useful and even a prominent part."

It is satisfactory to note that a definite announcement was made of a separate course for direct entry to the Provincial Service to begin in November next. This has long been called for—while equally satisfactory was the announcement that the Ranger classes will in the future be smaller—permitting of more individual attention being bestowed on the students. This is as it should be, and we should like to see the numbers in any one class restricted to 30 to 35, though perhaps this is too much to hope for just at present.

The Conservators present on the Board of Control were Mr. Copeland, Punjab ; Mr. Hill, Central Provinces ; and Mr. Lovegrove, Kashmir—all of whom expressed themselves well satisfied with the endeavours made to impart a practical education to the students.

FOREST COLLEGE ATHLETIC SPORTS, 1912.

The College sports are generally held at the end of October, just before the classes begin their cold weather touring, but on this occasion they were unavoidably postponed until the 28th and 29th of March. This accounts for the fact that the times for most of the events show a falling off as compared with last year's records, since the students were in camp, or worse still in the protracted

agony of their final examinations, until the eve of the sports, and had little time for regular training. Fortunately this drawback in no way affected the popularity of the sports, and the number of entries for the various events exceeded the total of the previous year, though the latter was itself a record. Competition was no doubt stimulated by a novel feature of the year in the shape of handsome cups which were provided from the athletic fund as first prizes for all the more important events. Eleven cups of varied designs, engraved with suitable inscriptions, were obtained direct from Sheffield, and were obviously much appreciated by the winners, who thus leave the College with permanent mementos of their prowess. The money prizes given in previous years soon took to themselves wings, after having in theory at least, transformed their winners into professional athletes! We therefore hope to see cash prizes superseded as far as possible in the College sports of future years.

The following are the names of the winners of the various events :—

Events.	*Winners.*
100 yards flat race ...	McDonald (Berar), 10$\frac{4}{5}$ secs.
120 yards hurdle race (10 flights of hurdles).	Mukerji (Bengal), 18$\frac{3}{5}$ secs.
Quarter-mile flat race ...	McDonald (Berar), 55$\frac{4}{5}$ secs.
Half mile flat race ...	Finney (Burma), 2 min. 14 secs.
One mile flat race ...	McDonald (Berar), 5 min. 15 secs.
High jump	Monro (Burma), 5ft. 5in.
Long jump	Finney (Burma), 18ft. 3in.
Putting the shot (18lbs.) ...	McDonald (Berar), 24ft. 9in.
Throwing the cricket-ball ...	Fernandez (Madras), 88 yds. 2 ft. 8 in.
Obstacle race	Nai Chan (Siam).
Sack scrimmage: Winning team.	McDonald. Finney. Monro. George.

The above events were open to students of the first and second years only. Many of them were keenly contested, notably the mile race, which produced a splendid finish between McDonald and Monro. The path of the obstacle racers was beset by many difficulties, the most popular (in the opinion of the spectators, if not of the runners!) being a water ditch, 20 feet wide and 9 feet deep, through which they had to splash their breathless way. Some of the best runners had evidently neglected the art of swimming, so careful watch had to be kept to check the numbers entering with those emerging on the further shore. Fortunately the account balanced, and no opportunity was found for demonstrating the art of resuscitating the apparently drowned. The tug-of-war was won after a determined struggle by eight stalwarts of the first year.

A novel event was a half mile race open to all residents of Dehra, Mussoorie, and the neighbourhood for which the fund provided a cup and two money prizes. These brought out a field of eleven starters, including representatives of the 2nd and the 9th Gurkha Rifles, and a capital race was won by E. C. Gwynne, a well-known Mussoorie athlete. Mapp, a third year student of the College, was a good second, and might possibly have been the winner had he had more time for training.

Among the spectators were Sir R. and Lady Carlyle, Mr. and Mrs. Beadon-Bryant, the Members of the Board of Control, and the President of the College. Mrs. Beadon-Bryant distributed the prizes as soon as the sports were over, and gave away at the same time the medal for the tennis tournament (singles) won by Turner, a third year student, and the cup for the College Marathon Race. The latter was run in October 1911 over the usual course of about 15½ miles, and was won by Rai Singh (Jubal State) in 1 hour 54 min. 40 secs., Mukerji (Bengal) being a close second. The time was about 7 minutes slower than last year, but as it works out to a little more than 8·1 miles per hour over a course which is far from level, it was a highly creditable performance.

Cultivation of the "mens sana in corpore sano" is further encouraged at the College by the presentation of a silver cup by the

Inspector-General of Forests to the best athlete of the year, and by a silver watch and chain awarded by the Hon'ble Sir Robert Carlyle for all-round efficiency at work and at play. The former was won by McDonald (Berar), who carried off the lion's share of the honours at the sports, and was also a useful member of the College football and hockey teams. Sir R. Carlyle's prize was, by the unanimous opinion of both staff and students, adjudged to Finney (Burma).

It will be seen from the above that athletics flourish at the College, which is as it should be. If we may be allowed a word of criticism, we would remark that too small a proportion of the students take advantage of the facilities afforded them of improving their physique by athletics and games. Many think that they have done all that is necessary to prove themselves thorough sportsmen by entering their names for the various races, and paying the entrance fees without having the slightest intention of training or running. For race after race the same small band of star performers faces the starter, while the great bulk of their fellow-students are content to look on. Similarly in football and hockey, the first elevens are everything and the rest count for little. What is wanted now is not further encouragement for men who are already keen on athletics for their own sake, but something which will induce the "slackers" to bestir themselves, to harden their limbs, and improve their mind.

The thanks of the College and staff are due to third year students Hore, Secluna and Chakko for the time and labour which they spent in organising the sports, and in perfecting the arrangements which enabled everything to be got through without the slightest hitch.

THE NEW METHOD OF RESIN TAPPING.

There appeared in *Capital* of the 7th December 1911 an article drawing the attention of Local Governments to a new method now adopted in certain parts of America of tapping Pine-resin, with the help of Gilmer glass cups. The article in question

leads the reader to believe that the wasteful methods hitherto employed in America and those now employed in India eventually result in the ' untimely end '—to use the writer's words—of even the finest Pine trees.

It is by no means instructive though somewhat amusing to read such statements, for one would have thought that even Indian Forest Officers could hardly have been accused of killing the goose or tree—whatever you like to call it—which lays the egg, in this case a resinous one.

The method of tapping adopted in India, with modifications to meet the local requirements, is that employed in France, which the senior men of the Indian Forest Department were taught at the National Forest School at Nancy, during their course of training on the Continent. To understand this method of tapping, the writer of the article in *Capital* might with benefit peruse the rules now in force for tapping in the Naini Tal Division. For reference they are given at the end of this article, and if any body doubts their suitability in practice, they can easily convince themselves that the trees do not come to an ' untimely end ' by inspecting the tapping operations in the forests to which these rules apply. The tapping is most carefully regulated, and in order to prevent the trees deteriorating, the rules lay down that the tapping of any tree shall only be carried out for five years, after which the tree shall be given a period of rest for ten years.

And now to turn to the new method of tapping with the Gilmer glass cups. It may at once be said that the method is of sufficient interest to attract serious notice. It is understood that experiments have already been started in this connection in the Punjab forests, and similar experiments are contemplated in those of the United Provinces. The United States Forest Department, who are always ready to give help when asked to do so, have already sent the Conservator of Forests, Western Circle, United Provinces, a report on the results they have obtained by tapping Pine with the help of the new glass cup. It is by the courtesy of the Conservator of Forests, Western Circle, United Provinces, that it is possible to give a copy of this interesting report, received

from the Director of the Forest Products Laboratory, Wisconsin, America.

"The Forest Service hung 250 of the Gilmer glass cups on four grades of timber in the Choctawhatchee National Forest with the following results :—

Grades.	Weeks.								
	1	2	3	4	5	6	7	8	9
	c. c.	c. c.	c. c.	c. c.	c. c.	c. c.	c. c.	c. c.	c. c.
Slash pine ...	268·5	396·5	456	541·0	593	611	649	727 5	875
Good yellow pine	144	230	310·5	310·5	310·5	310·5	310·5	310·5	310·5
Medium yellow pine	85	120	155	155	155	164	191	191	230
Poor yellow pine ...	85	94	120	155	155	164	182	191	220

"This cup does reduce the fire risk, prevent loss of gum, and contamination with dirt, but only the highest grade of best flowing timber will yield sufficient gum to render the use of this cup remunerative so far as the experiments of the Forest Service extend.

"The glass cups with directions for hanging them may be obtained from the Gilmer McCall Turpentine Cup Company, Mobile, Alabama."

It will be seen from this report that even the American Foresters are as yet by no means convinced as to the enormous superiority of this new method of obtaining the resin from Pine trees. There is another point which is not touched on in the American report, and that is, that the holes bored obliquely into the timber of the tree can never be again filled with woody tissue, though the end may be closed over and the remaining cavity filled with resin. Thus from a timber-yielding point of view the tree must inevitably be much injured, more so even than by the present method of tapping by which the external wounds are covered over within ten or fifteen years of being blazed.

"RULES FOR TAPPING IN THE NAINI TAL DIVISION AS AT PRESENT IN FORCE.

"The following revised tapping rules are circulated for guidance :—

2. Attached is a statement showing the areas so far set aside for tapping. Early in he year the trees in the areas set aside for tapping will be numbered with a serial number as the numerator and the numbers of the channels as the denominator, *e.g.*, 2674/2 which means that 2674 is the serial number and 2 the number of pots the tree is to carry. Each compartment will have a series of its own. The Forester or a trusty Forest Guard can number the compartments to be light tapped and the Range Officer those compartments to be heavy tapped. Heavy tapping will be only carried out in those areas to be felled for firewood within the next five years and only those trees in them will be heavy tapped that are to come out at the felling, the remaining trees in the coupe being light tapped.

Number of pots per tree.

3. *Light tapping* :—One pot for trees between $3\frac{1}{2}'$ and $4\frac{1}{2}'$ in girth.
Two pots for trees between $4\frac{1}{2}'$ and $7'$ in girth.
Three pots for trees over $7'$ in girth.

Heavy tapping :—One pot for every foot in girth of bark.

Method of tapping : *Hanging of the pots.*

4. Having arranged for pots, tools and lips, the pots will be hung on the trees as follows. Choose places for the pots at the base of the tree, taking care that when two or more pots are prescribed that they are equidistant from each other, then cut a channel 4" wide by 1" deep and about 6" long at the base, so as to allow a free hang to the top, place the lip (a piece of thin iron sheet 5" by $1\frac{1}{2}$") in a curved incision (made by a special chisel with that curve), care being taken that the lip slopes downwards from the tree and underneath towards a side drive in a nail on to which the pot will be hung.

The channel when first cut should be 4" to 6" long above the lip. For the cutting of a channel an ordinary *sharp* adze is required. When commencing work for the year on trees already tapped, the old lip will be extracted and inserted at the head of the previous year's channel, the pot being hung below it as before.

Freshening.

5. For this a *very sharp adze* (Basula) is required. As the flow ceases, which, according to the time of year, may be after one, two or three weeks, a point on which the Range Officer and Beat Guards must be particularly careful, the channel will require freshening at the top. This is done by the removal of a thin shaving not more than $2\frac{1}{2}$" of the vertical length of the tree. The flow has ceased because of the clogging of the outlet of the resin ducts, and all that is necessary is to remove those clogged and to open out other ducts—the ducts more or less ramifying through some 2" or so of outer wood in a vigorous 1st class tree.

No hard-and-fast rule can be fixed as to the length of the channel to be cut each year, as this depends on the extent of the freshening necessary and on the tree itself as a resin-producer. A maximum of 15", however, is fixed ; but the less the better, as the longer the use of the ladder is postponed the more quickly can work be done.

The cutting of the bark on the sides of the channel is not allowed; simply remove the old pieces of loose bark by hand and put a piece of bark over the pot itself to prevent foreign matter falling into the resin.

Collection.

6. As the pots become full they must be emptied of their resin. Here again no fixed period can be fixed, but during the season of greatest flow once every fifteen days is necessary, but otherwise not less than once a month. As a rule, the resin should not be allowed to reach within ½" of the nail hole or the top of the pot, whichever is lowest.

The collection will be made by means of wooden spoons, the resin being put into kerosine oil tins fixed up with a handle, which will be emptied into other tins at convenient centres for transport to Bhowali.

7. Tapping will go on for five successive years between about the 15th March and 15th November according to season and then a rest of ten years, so that during fourteen years the 4" channel should be closed over by callous formed on the sides."

R. S. PEARSON, I. F. S.,
Forest Economist.

FOREST ADMINISTRATION IN THE UNITED PROVINCES, 1910-11.

[*Contributed.*]

The total forest area of the United Provinces underwent practically no change during the year, and stood at 13,244 square miles on the 30th June 1911. It is worthy of note that nearly three-fourths of this area still consists of so-called "District Protected Forests" under the management of District Officers. We understand that a considerable area of these protected forests is about to be reserved, and will in the near future come under the direct management of the Forest Department, which we take to be a change long needed. There appear to be at present no working-plans for these protected forests, aggregating 9,070 square miles, so the Department will have a heavy programme of work to face when the best portion of them comes under their management. Fortunately the Provinces are in the enviable position of having working-plans for practically the whole of their reserved forests. Some of these plans will lapse during the next few years, but the labour involved in renewing them should be comparatively small,

so we trust that it will be found possible to make early provision for the regular working of these latest acquisitions when they enter the departmental fold.

As is usual in the United Provinces, there has been liberal expenditure on roads and buildings. Leaving the District Protected Forests out of account, the total cost of such works in the Eastern and Western Circles has been about Rs. 32½ per square mile—less than in past years, but still a long way in advance of most other Provinces in India. There can be no doubt that wise liberality on these lines in the past is one of the main causes of the present prosperous state of the provincial forest finances. There are, however, signs that liberality may at times be overdone. The following item is culled from one of the Circle reports :—

"Completion of re-roofing of Rest-house—Rs. 2,580." It would be interesting to know the total cost of the completed roof of this mansion, and why a roof in the United Provinces should cost twice as much as is ordinarily allowed for the construction of a whole Rest-house in an adjacent circle of a neighbouring province!

There has been a large increase in the number of forest offences recorded, but it is explained that this is due to the introduction in one circle of a new system of registration under which cases on which no action is taken are registered. It is somewhat surprising to find that an obvious reform of this nature has only now been introduced into one of the most "advanced" circles in India. Fire-protection, thanks to a favourable season, was remarkably successful in all divisions, except Bundelkhand, where incendiarism is said to have been the cause of six fires burning nearly 15,000 acres. This practice is said to be a novelty in Bundelkhand, and we hope that vigorous measures will be taken to nip it in the bud. Unfortunately the suspected incendiaries escaped detection in all cases, leaving perhaps some room for doubt as to the real causes of these fires. But it must be admitted that if the people are really determined to fire the forests and set about the business with any degree of care and secrecy, detection of the actual culprits is never likely to be more than a rare accident. In

such cases reliance must be placed upon punitive closure of the burnt areas, whereby it is soon brought home to the country side that it is to every one's interest to preserve the forests from fire.

Grazing does not appear to present much difficulty except in Bahraich and Gorakhpur. In the latter division the incidence of grazing is about five animals for every two acres of forest, and we can well believe that this is "incompatible with the maintenance of the forest." A solution is being sought, as in other provinces, along the lines of replacing grazing by grass-cutting, but it does not appear that much progress has as yet been made towards this desirable goal. Any innovation of this nature is bound to be highly unpopular at the start, but besides offering the only means of providing permanently for the ever-increasing wants of the cattle, it will, if persisted in, prove to be of great benefit to the animals themselves.

It is re-assuring to read that "it is probable that the drought of 1908 has left no permanent mark on the majority of the forests, though its effects may influence their management for a considerable time." In the Kheri Division the level of the sub-soil water is reported to have risen 1 foot 8 inches during the year. So the *status quo* is being restored, though more slowly than might have been expected. It would be interesting to know how far the water-level is still below the mark at which it stood just before the drought. During 1910-11 the forests seem to have escaped any widespread or material injury from natural causes.

The results of certain experiments undertaken in Gorakhpur to determine the best method of coppicing are well worth the attention of all Indian foresters who are concerned with this system of treatment. The species under observation was presumably Sal, though this is not clearly stated in the report, and three methods of coppicing were tried :—

(i) flush with the ground with a trimmed stump as laid down in the European text-books ;

(ii) at a height of 4 to 6 inches with a trimmed stump as above ;

(iii) at the same height with an untrimmed stump.

In all cases the first, or text-book, method was found to be decidedly the *worst*. For trees up to three feet in girth, the third method was found to be slightly superior to the second, while for trees from three to six feet in girth the second method gave the best results. The above data have been confirmed by a similar experiment in the Siwaliks, and it appears that flush coppicing of Sal has been, or is about to be, abandoned throughout the provinces. We should like to see these experiments extended to other species and tried in other provinces where coppice reproduction is of even more importance than in the United Provinces. They might well be combined with experiments designed to test the best season of year for coppice fellings.

A good deal of sowing has been done in what appears to be a rather desultory fashion, and the results have been generally disappointing. The scheme for afforesting the large grass blanks in the Kheri Sal forests, of which great hopes were entertained on somewhat insufficient grounds, has had to be abandoned, and the work is for the present restricted to small experiments. It is obvious that the Department has still much to learn with regard to artificial regeneration, and that until further experience has been gained, it is not advisable to sink much money in such operations.

The financial results of the year show a decided improvement on previous figures. The net surplus of the two circles amounted to 52 per cent of the gross revenue, and was Rs. 13,55,182 or Rs. 325 per square mile of forest area. This improvement, with the increased outturn of forest produce to which it corresponds, is in part due to large sales of dry timber, a legacy from the drought of 1908, and when this supply is exhausted there may be a considerable fall for some years in both outturn and revenue. But there are signs of improving demand and rising prices everywhere. The resin industry in Naini Tal has done particularly well, having yielded a net profit of Rs. 85,195. It has apparently been decided that this industry shall remain permanently under departmental management, the reasons given being "the vital importance of successful fire conservancy, and the necessity of regulating the tapping with a view to the future interests of

the trees and not to the maximum immediate yield of resin." No doubt this question has been carefully considered, but the reasons quoted for the decision do not sound convincing. As regards danger of fire men employed in collection and transport of resin are just as much subject to the provisions of the Forest Act when serving a private employer as when working for the Department direct. Indeed, we read in the report that the work of tapping and collection of resin in a whole sub-division has been given out on contract "with excellent results." As to the safety of the tapped trees, there seems no reason why this could not be thoroughly guarded by detailed restrictions and conditions in tapping leases, if these were offered to private traders. We believe that it is generally accepted as an axiom that purely commercial undertakings of this nature are better left to private enterprise, and we venture to express a hope that the question of departmental *versus* private management will not be regarded as settled once and for all."*

An attempt to introduce English trout into some of the lakes and streams of the Naini Tal district, does not appear to have met with much success so far. We should like to know whether this experiment is supposed to have any utilitarian object, or whether it has been undertaken merely for the amusement of summer visitors to the Hills ; also, how much has been spent upon it, and whether the cost has been debited to the Forest Department.

We congratulate the provinces on a prosperous, if uneventful, year, and on continued progress in varied fields of forest activity, in many of which they continue to show the way to less favoured regions of the Indian empire.

* We must express our disagreement with these remarks as we consider it essential that resin-tapping and collection remain in the hands of the Department.—[Hon. Ed.]

TURPENTINING IN FLORIDA ON AN AMERICAN NATIONAL FOREST.

BY THEODORE S. WOOLSEY, JR.

To thoroughly understand the policy and methods that underlie Federal turpentine operations in Florida, it is well to first give a general *resumé* of conditions.

The (Choctowhatchee) Florida forest where operations have been commenced is situated in southern Florida, near Pensacola. The ground is unusually level, rising from tide water to an extreme elevation of perhaps 300 feet. The forest is bounded on one side by tide water and is drained by numerous streams. The grazing business is unimportant and does not seriously affect the management. There is some forest settlement although the sandy soil has prevented extensive agriculture. The fire protection has not proved a success, and because of the expense it is to be restricted to those areas where the turpentine operations have commenced. The free use of fuel wood is practically unrestricted, because the small population uses an inappreciable amount and because the pitch faggots used are not only of no value, but actually a fire menace. There are no timber sales at present. Forestation has been started and consists mainly in sowing maritime pine and dibbling cork oak. The present stand is chiefly over-mature long leaf pine of slow growth and small size. It rather resembles a stand of chir pine growing on an unfavourable situation in the Himalaya Mountains.

The main business locally is turpentining and much of the Federal land was alienated and patented under the Homestead Act before the forest was proclaimed. The (Choctowhatchee) Florida forest was first put under administration early in 1910, and during the first year the turpentine leases gave a gross revenue of $4,238·50 and during the year ending June 30th, 1911, the leases amounted to $8,268·68. The privilege of boxing long-leaf pine was first advertised at a minimum rate of $65·00 per thousand cups for a period of three years. The price has risen, however, owing to an unusual demand to $100·00 per thousand cups for three years. The working season lasts from March 1st to

November 1st. A streak is cut each week, giving a series of incisions at the end of the season about three feet in height. The gum is dipped every four weeks and the scars are scraped at the end of the season.

In accordance with conservative methods * of turpentining, the Forest Service insists upon the use of some satisfactory cupping system. In other words, the old-fashioned gash at the foot of the tree to catch the resin is no longer allowed. No cups are sanctioned on long-leaf pine less than 11″ in diameter; but one cup on trees 11″—15″; two cups on trees 16″—20″; three cups, but no more, on trees 21″ and over. The restrictions imposed allow "faces" 9″—14″ wide, and the operator must leave strips of bark or "bars" 4′—6′ in width between each face. The inspector must see that the "faces" be of uniform width and depth. A complete working-plan has already been made for the forest, and the yield in cups is calculated on the following basis for the average acre:—

1—3 years, 20 virgin cups;
4—6 ,, 20 high-face cups;
7—9 ,, three year period of rest;
10—12 ,, 10 back cups;
13—15 ,, 10 high-face back cups.

It will probably be at least ten years before the full cupping privileges on the forest are utilised. It is expected that after these fifteen years of cupping the tree will be ready for the axe, and can be readily sold to sawmill men. In the ordinary contract, the operator is required before January 1st of each season to rake a cleared space, of about two and one-half feet in diameter, around the bottom of each tree, and a fire-line at least 3 feet in width around the entire turpentine operation. The following sample contract gives an excellent idea of the requirements imposed in all leases:—

United States Forest Service, Florida National Forest.

TURPENTINE PERMIT.

_____ 191____

IN CONSIDERATION of the granting to_____of this Permit to work for turpentine certain longleaf and slash pine timber on

* Based on manuscript data compiled by A. B. Recknagle and I. F. Eldredge.

an area to be definitely designated by a Forest Officer before cupping begins, located in _____

_____

_____

Tallahassee Meridian within the Florida National Forest, estimated to contain _____cups more or less_____ do hereby promise to pay to the First National Bank of Albuquerque, New Mexico, (U. S. Depository) for said Permit at the rate of _____ ($_____) dollars per thousand cups in _____ payments of at least_____ of the total amount due, credit being given for the sums, if any, hitherto deposited with the said First National Bank of Albuquerque in connection with this Permit; and_____ FURTHER PROMISE AND AGREE, should this Permit be granted to_____to work said timber in strict accordance with the following and all other related regulations governing the National Forests and prescribed by the Department of Agriculture:—

1. Timber on valid claims and timber under other contract is exempt from this Permit.

2. No tree will be cupped, chipped, raked or worked in any manner until the first payment has been made.

3. No gum or other product of the timber will be removed before the cups on the area have been counted and recorded. Title to the product of the timber included in this Permit will not pass to the permittee until it has been paid for as herein prescribed.

4. No timber will be cupped except that on the area designated by a Forest Officer; and no marked tree or trees under the diameter limits will be cupped or chipped under any consideration.

5. No tree_____ inches or less in diameter will be cupped; not more than one cup will be placed on trees from _____ to_____inches inclusive in diameter; not more than two cups will be placed on trees from _____ inches to_____inches inclusive in diameter, and not more than three cups will be placed on any tree. All diameter measurements are to be taken at a point two and one-half feet above the ground.

6. So far as possible, the depth of all streaks will average one-half inch or less, and in no case will the depth of streaks exceed three-fourths of an inch not including bark. The width of the streaks will be so regulated that no more than one-half inch of new wood will be taken from the upper side with each streak and so that the total height of the faces shall not exceed fifty inches during the life of this Permit. Bars or strips of bark no less than four inches wide in the narrowest place will be left between faces, and the edges of faces will be parallel with each other and be placed vertically up the tree. So far as possible, where more than one face is placed on a tree, one bar between them will not exceed six inches in width. No more than one streak will be placed on any face during any one week. The chipping will be uniform in depth from shoulder to peak. Faces not chipped in accordance with these specifications may be marked out and the cups removed by the Forest Officer.

7. One of the modern cupping systems will be used, and the cups and aprons or gutters will be so placed that the shoulders of the first streak will not be more than_____inches distant from the bottom of the cup, and the cups will be placed as near the ground as possible. No wood will be exposed on any tree by removing the bark below the gutter or aprons.

8. No unnecessary damage will be done to cupped trees, marked trees, or to trees below the diameter limit. Trees that are badly damaged during the life of this Permit, when such damage is due to carelessness or negligence on the part of the permittee, shall be paid for at the rate of $5 per 1,000 feet B. M., full scale, and the Forest Supervisor shall decide as to the presence and extent of damage.

9. No cups will be placed later than_____191____ without written permission from the Forest Supervisor, and all timber embraced in this Permit will be cupped before said date.

10. Unless extension of time is granted, all timber will be cupped, chipped, dipped, scraped; the product and all cups, aprons, gutters and nails removed and each cupped tree thoroughly raked

to the satisfaction of the Forest Officer, on or before and not later than _____ 191__

11. No fires shall be set to the timber, underbrush or grass on the area included in this Permit without the written permission of the Forest Supervisor, and every effort will be made by—— , —— employees ; sub-contractors and employees of sub-contractors, to prevent the burning over of said area from any unauthorised cause ; and during the time that this Permit remains in force and effect_____and all_____ employees, sub-contractors, and employees of sub-contractors, without any charge whatsoever to the Forest Service, will do all in our power both independently and on request of Forest Officers to prevent and suppress unauthorised forest fires.

12. All cupped trees will be raked in a workman like manner for the space of 2½ feet around each tree before January 1st of each year of the life of this Permit ; and a fire-line not less than three feet wide in the narrowest place shall be hoed or plowed around the area covered by this Permit in such a manner as to completely isolate it from adjoining lands. Natural fire brakes, such as creeks, swamps, roads, etc., may be utilised with the consent of the Forest Officer. These fire-lines must be made and receive the approval of the Forest Officer before any cups are placed the first year or new streaks made at the beginning of the second and third years.

13. Special Use Permits will be obtained for such cabins, shelters, camps, telephone lines, etc., as may be required on Government land in carrying out the terms of this Permit.

_____

_____

_____

_____

_____

_____

_____

_____

The decision of the District Forester shall be final in the interpretation of the regulations governing this Permit.

Work may be suspended by the Forest Supervisor if the regulations contained in this Permit are disregarded, and the violation of any one of said regulations, if persisted in, shall be sufficient cause for the District Forester to revoke this Permit and to cancel all other permits for other privileges.

"No member of or delegate to Congress, or Resident Commissioner, after his election or appointment, and either before or after he has qualified and during his continuance in office, and no officer, agent, or employee of the Government shall be admitted to any share or part of this contract or agreement, or to any benefit to arise thereupon. Nothing, however, herein contained shall be construed to extend to any incorporated company, where such permit or agreement is made for the general benefit of such incorporation or company. (Section 3741 R. S. and Sections 114-116, Act of March 4th, 1909.")

No person undergoing a sentence of imprisonment at hard labor can be employed in carrying out the terms of this Permit. (See Executive Order of May 18th, 1905.)

Refund of deposits under this Permit will be made only at the discretion of the District Forester, except when the amount of such deposits is more than the total amount required under this Permit.

This Permit is non-assignable. (See Section 3737, Revised Statutes of the United States.)

The conditions of this Permit are completely set forth herein, and none of its terms can be varied or modified except with the written consent of the Forest Supervisor. No subordinate Forest Officer has, or will be given authority for this purpose. If required as a guarantee of a faithful performance of the conditions of this Permit_____ will submit a bond in the sum of_____ ($_____) dollars, which bond, together with all moneys paid or promised under this contract, upon failure on_____ part to fulfil all and singular the conditions and requirements herein set forth, or made a part thereof, shall become the property of the United States as liquidated damages and not as penalty.

Signed in duplicate this _____ day of _____ 191——

WITNESSES :

_____ [SEAL.]

Name of Company.

_____ [SEAL.]

Name of Officer Signing.

_____ _____

Title of Officer Signing.

APPROVED and Permit granted under the above conditions on this _____ day of _____ 191 ____

_____

Name

_____ _____

Title

CORRESPONDENCE.

TO THE HONORARY EDITOR, INDIAN FORESTER.

A PLEA FOR ECONOMIC FORESTRY.

SIR,—I should like to make a few remarks on the article on the above subject by Dr. Blascheck in the March issue of the *Indian Forester*. Dr. Blascheck desires, I understand, the introduction of the financial rotation, but for the following reasons I think this would be a mistake. In the first place the rotation in India generally has to be fixed by technical considerations. In the case of deodar, for example, the trees must be large enough to yield sleepers with a minimum waste, and not so large as to be liable to damage when felled on a steep hillside. Between these two requirements there is probably room for considerable variation of rotation. Suppose we utilise the mean annual increment check to fix the rotation between these limits and, provided that it is not higher than the maximum technical or the physical rotation, adopt the rotation where the mean annual volume increment

culminates, I assume that within the limits of the technical rotation the value of the timber is the same ; if it is not, then 'value' may be substituted for 'volume.' This rotation gives the greatest yield per acre per annum. The above method of calculating the yield has been adopted in some Indian working-plans. Since, in the absence of Yield Tables, figures have to be collected from trees instead of woods, the method is defective in that it takes no account of the decrease in the number of trees as the age increases ; but Dr. Blascheck's method has the same defect and indeed the only point in which it differs from the above is that he would further take into consideration an arbitrarily fixed rate of interest which capital ought to yield. If the rotation worked out by his formula indicated a lower rotation than the already established rotation of the greatest yield, he would say, in effect, you must reduce your rotation and consequently your yield per acre per annum from the forest because, by an investment of the capital obtained from the disposal of your surplus growing stock (surplus on account of the reduction in the rotation) at the current rate of interest, you can obtain a larger income from your remaining growing stock plus investment, than you at present obtain from your existing growing stock.

Now this is very nice in theory but in practice there are many objections. On page 206 of Vol. III of Schlich's Manual some of them are given and there is of course the fact that the rate of interest is fixe darbitrarily. Finally, there is the difficulty that would be experienced in persuading the Government of the day that certain forest revenue was not current revenue and must not be treated as such, and in persuading Governments of the future that a system whereby their income from forests was reduced, was really putting more money into their pockets than their predecessors obtained. In practice in fact the capital removed from the forest by the reduction in the rotation would not be invested but would be used to benefit the present at the expense of future generations. If we had to create forests from the start and borrow capital in hard cash at the current rate of interest to do it with, Dr. Blascheck's system would be admirable ; but when nature has

given us the capital we are probably better advised in taking nature's own interest, that is, the rate of increase in the yield, as the standard by which to judge of the activity of that capital, rather than an arbitrarily fixed money standard.

There is a good deal of room for doubt as to whether Dr. Blascheck is correct in thinking that present rotations are too high and that with scientific working trees should attain a certain size sooner than under uncontrolled natural conditions. In the first place, as was pointed out by a writer in the *Indian Forester*, about a year ago, I think, in some instances it has been proved that working-plan anticipations of rate of growth based on ring countings and measurements on stumps of felled trees were unduly optimistic, a circumstance which the writer considered probably was due in part to the tapering of the stem between the stump and breast height, where the tree was measured for felling. Then it is probably a fact that the sapwood of deodar is considerably inferior to the heartwood for the purpose of sleepers; and if this is so, though the fact may not at first be realised by purchasers, any reduction of the rotation resulting in an increase in the proportion of sapwood is bound in the long run to affect adversely forest income. Further, scientific forestry tends to produce a larger number of trees per acre and *ipso facto* causes a slower increase in girth of individual trees.

Dr. Blascheck has raised a very large subject on which there are bound to be differences of opinion as regards details, but few, I think, will be found to quarrel with his conclusions as to the necessity for more attention being paid to economic considerations in Indian forestry. With regard to surplus growing stock the tendency certainly seems to be to display too much caution. I have even heard it stated as regards a certain working-plan that its felling prescriptions must have been too heavy because enumerations after it had been in force some years showed that the number of 1st class (*i.e.*, over-mature) trees had been reduced. But the peculiar views of the layman on the subject of forest revenue as explained above must be taken into consideration. When we inflate our revenue by the disposal of this surplus

we should not leave it to our successors to explain their failure to realise as much revenue as their predecessors.

The cash surplus is about the worst possible guide as to the efficiency or inefficiency of Forest Administration, and it is unfortunate that comparison of surpluses should sometimes be made in reviews on Annual Reports in such a manner as to suggest otherwise. An administrative officer is of course entitled to take credit for current increase in revenue due to business acumen on the part of himself or his subordinates, and his superior is entitled to comment on lack of such business acumen, but such remarks should be kept apart altogether from remarks on the surplus *quâ* surplus, which should never be used as an argument.

M. R. K. JERRAM,
D. C. Forests.

OPEN LETTER OF THANKS FOR A TESTIMONIAL RECEIVED BY SIR WILLIAM SCHLICH AT HIS RETIREMENT.

SIR,—I take the liberty of asking the favour of your publishing these lines in the *Indian Forester*, the periodical which I had the honour of starting in 1876.

My former and present pupils, as well as other Indian Forest Officers, have been kind enough to present me with a beautiful Burmese silver bowl and a cheque for a considerable amount. The bowl bears the inscription :—

> "Presented to Sir William Schlich, K.C.I.E., F.R.S., by Officers of the Indian Forest Service on the occasion of his retirement after 45 years in the service of Government."

I desire to offer to all my friends my most sincere thanks for the two presents. The bowl will remind me, for the rest of my days, of the kindly feeling and goodwill of my friends, which prompted them to think of me on the occasion of my retirement.

Forty-five years is a long time to look back upon, and I can honestly say that I have tried hard to do my duty to India and to the numerous students, whom it was my good fortune to guide through their course of study. And now I find that on the 1st

July 1911, 86 per cent of the superior forest staff of India were my pupils, and by the time that the last of the present Probationers have joined in India, that percentage will not be far from 100. That is a most satisfactory thought for me, but it reminds me of the great responsibility resting on my shoulders. I trust that the development of forest administration in India during the next generation will justify the lines on which I directed the studies of my pupils.

It has been left to me to deal with the cheque, which I have received, as I think best. I have decided to bring the amount up to £500, and to let it be the first donation towards an endowment of a Chair of Forestry at the University of Oxford. It is well known that I organised at Coopers Hill, in 1885, the first School of Forestry in the United Kingdom, and that it was transferred to Oxford in 1905. Unfortunately, under the late orders of the Secretary of State for India, the State Endowment of the Professorship has ceased, and the University cannot endow it anew, though it has made temporary arrangements to continue the School on the lines hitherto followed.

I feel very strongly that this oldest British School of Forestry should not be allowed to come to an end, and I have appealed to the several Oxford Colleges for assistance. If I meet with response in this direction, I shall appeal to some of the City of London Companies, and perhaps the Secretaries of State for India and for the Colonies may help. Finally, an appeal will be made to the Development Commissioners who, if they are inclined to do so, can double the sum collected. Possibly, some private forest proprietors may also help. On the whole I am hopeful that the scheme will succeed, and if not, I shall have to reconsider how to utilise the money which my friends have presented to me.

Once more, let me thank my friends most heartily, and assure them that they have given me a great joy. I wish them all success in their professions.

Believe me,

Yours very truly,

W. SCHLICH.

TIGER CLIMBING TREES.

SIR,—A curious incident came to my notice a few days ago, which may be of interest to others, showing that a tiger can climb trees, when he tries. A man-eating tiger had for some time been terrorising the country round Naini Tal, and carried off about 15 native women in a period of three or four months. On the 27th February of this year, he killed a woman at a place called Kilberry, about 6 miles from Naini Tal, taking her out of a crowd of about 20 women, who were grass-cutting near some thick scrub in which he had been lying up. The women rushed back to their village, and a body of relatives of the woman who had been seized sallied out and found the body, which they tied up on a fairly small rhododendron tree (about 2 feet girth), in the higher branches, 15 or 20 feet off the ground. The news was then sent in to Naini Tal for some Sahib to come out. A Mr. Sykes had the khabbar, and went out direct to the spot, but when he arrived at the tree, the body had gone. An examination of the tree and surrounding ground showed that the tiger must have succeeded in climbing the tree and removing the body, but that he had experienced extraordinary difficulty in getting up, and must have fallen down half a dozen times in the attempt. The stem of the tree was torn and clawed and scratched most amazingly, and some of the claw marks were nearly half an inch deep. Patches of the beast's hairs were all over the place, on the tree, and on the surrounding ground. When he ultimately reached the body, he seems to have tumbled off the tree anyhow, taking the body with him.

As the beast is still at large it is reassuring to think that he is not very expert at tree-climbing, for if he were, even sitting in a machan for him would have an added spice of excitement about it.

17th March 1912. E. A. SMYTHIES, I.F.S.

SHOOTING A PARD.

SIR,—I lately shot the pard in the Kurnool Mallamalais. It returned to a half-eaten buffalo at about 9 P.M. As there was no moon I had fitted a little 4-volt electric light in a bamboo clump near the kill, and used a 12-bore with white tape gummed down the top of the barrels.

On hearing the crunching of buffalo ribs I turned on the light. A 4-volt lamp does not give a very powerful light and it was some five seconds before I could distinguish the pard from the surrounding dry bamboo clumps. The pard paid not the smallest attention to the light, and continued to consume the ribs. I fired however as quickly as I could, whereupon the pard charged away straight ahead, almost colliding with the shelter in which I was sitting. After a few minutes came the welcome sounds of a dying pard, and I went back to camp. Some Chenchus and I found him lying dead some 100 yards from the shelter next morning. Whether before or after his death he seems to have had words with an irate porcupine. Eight large quills had been driven 2½ inches into the pard's spine-muscles.

It is nice to think of the pleasure that I have provided for the porcupine. How it must have chuckled! "Met a large pard last night, my dear"—"Oh! How frightened you must have been, darling!"—"Frightened? No! I just went for it, and left it pretty well dead, I fancy. Frightened of a wretched pard?! Tut! Tut!" *ad lib.*

Can any one give me the benefit of their experience of the tiger's behaviour under an electric light? On one occasion a tiger returned to a kill over which I had fitted an electric lamp, but foolishly I had not secured the kill in any way (being a complete novice); but before I was ready to turn on my light he had picked up the kill and had marched off with it.

I ought perhaps to apologise for describing anything so humdrum as the slaying of a pard, but I hope the porcupine incident may be of some interest.

KURNOOL: A. F. MINCHIN, I.F.S.
South India.

ANIMALS IN SICKNESS.

It is not easy to watch the larger animals when these are stricken by disease ; or when an animal in a state of nature finds itself unable to carry on its usual life, it retires into the depths of the forest, or to some hiding place and dies unattended and alone. Sympathy from those of its own kind it cannot expect, for life is too much of a struggle to admit of much kindness being shown by one creature to another, though instances have been known where some kind feeling has been displayed as in the case of a wounded elephant, whose companion aided its escape ; but in most of such cases the animals have been brought into contact with man, for in a natural state it is rare.

At the present time, when most civilised nations are producing even greater numbers of degenerates, that is, those unfit either in body or mind, or both, to benefit the race, it may be that we may learn something from the lower creatures as to how they keep up their high standard of health ; for it is a remarkable thing that wild animals conform to every known rule of health and have practised such rules from times unknown.

Though wild animals know instinctively that " prevention is better than cure," there are several remedies known to some of them in case of sickness, provided this is not infectious. When an epidemic breaks out among them they seem powerless to avert ruin, and whole districts are decimated by such a disease as the terrible rinderpest, which a few years ago deprived large districts of Africa of almost all wild game. This disease is almost exactly similar to anthrax, and acts in the same way ; possibly, therefore, it was introduced by man, and may have begun its ravages by being imported into Africa with some domestic breed of animal. Indeed, it is not unlikely that most of the epidemics among wild animals may have come to them from man in some form or another.

Animals will do anything to keep themselves in perfect condition, and they have learned in the course of ages that cleanliness is one of the conditions of health. It is wonderful what care all creatures will take to keep themselves and their dwellings clean, and a bird's nest even when the parents are most

busy feeding their ravenous young ones is usually beautifully clean. The care they will take of their skins and coats, or in the case of birds of their plumage, is wonderful.

Many ages before mud-baths came into fashion among humans, the curative value of mud was known to many animals, and animals in tropical countries frequently take mud-baths ; indeed, wounded elephants and other large quadrupeds will roll themselves in the mud of a river-bank and will fill up the wound with mud if they possibly can, while wounded birds will sometimes also fill up a wound to prevent foreign matter getting into the wound, which they seem to know from experience will do mischief.

Luckily perhaps for themselves, the vast number of drugs and medicines wherewith poor humanity is dosed are unknown ; but there are several plants which animals use as medicine, and it has even been said that we have learned the value of some such by watching the use made of them by animals and birds. Thus it has been told that the healing value of the springs of Bath became known by watching a sick pig which drank the water ; and though we no longer believe that snakes rub their eyes with fennel to improve their eyesight, yet certain plants are certainly eaten by animals to produce certain results. Thus in tropical countries capsicums are eaten by various birds when these feel they need a stimulant, while in our colder climates the wild arum and other plants with biting flavours are eaten for the same reason. Mammals, too, will eat grass, the sharp blades of the sword-grass being in demand among dogs and cats when they require an emetic ; while grass-eaters will travel long distances to procure salt ; indeed, their extreme desire for salt has been the means of bringing many of them to destruction, for hunters take up their position near the "salt-licks" in the same way as they do near the drinking places in hot countries.

Digestion is a thing carefully looked after by wild creatures ; they seem to know how important it is to their life that this should be kept in perfect order. Thus dogs and cats will eat ashes now and then, and birds and even snakes will swallow stones to aid digestive powers. When hens are laying, of course, they require

lime to form the shells, and the amount of grit and fragments of stone they then eat is incredible; if they have been confined in a small place for some time and suddenly turned loose upon a heap of gravel or where they can obtain small stones and grit, they will be seen devouring them as if the heap had been formed of corn.

When the last stage comes as it must come to all things, wild or tame, the end is usually merciful in its speed. To die a violent death is the fate of most wild animals, and surely this is preferable to the wasting plague or slow decay which awaits so many of us, added to which they have not the anticipation of evil we possess, and which is the worst part of suffering. Now and then one of them may linger on into old age, but as a rule, when a wild thing can no longer maintain its high standard of activity, it perishes at once. When the last hour comes it will separate itself from its fellows and get into the most private place it can find, so that it is seldom anyone has watched a wild animal die. It seems that the first requirement of a stricken animal is to be at peace from friends and foes alike.—[*Globe.*]

BRITISH FORESTRY.

The Right Hon. Walter Runciman, M. P., President of the Board of Agriculture and Fisheries, has appointed a committee to advise the Board on matters relating to the development of forestry. References will be made to the committee from time to time as occasion arises. The committee will be asked in the first instance (1) to consider and advise upon proposals for a forestry survey; (2) to draw up plans for experiments in sylviculture and to report upon questions relating to the selection and laying out of forestal demonstration areas; (3) to advise as to the provision required for the instruction of woodmen.

The committee is constituted as follows: Sir Stafford Howard, K. C. B. (chairman), Mr. F. D. Williams-Drummond, Sir S. Eardley-Wilmot, K.C.I.E., the Right Hon. R. C. Munro-Ferguson, M.P., Lieut.-Col. D. Prain, C.M.G., C.I.E., F.R.S., Mr. E. R. Pratt, president of the Royal English Arboricultural Society; Professor Sir W. Schlich, K.C.I.E., F.R.S., Professor Wm. Somerville, D.Sc.,

the Hon. Arthur L. Stanley, Mr. R. L. Robinson, of the Board of Agriculture and Fisheries will act as secretary.

As announced in reply to a question asked in the House of Commons on Tuesday, February 20th, Sir E. Stafford Howard has tendered his resignation of the office of one of the commissioners of His Majesty's Woods and Forests. His resignation will take effect as from March 31st next. No new appointment of a Commissioner will be made to fill the office he vacates, and there will be a fresh allocation of the Commissioners' duties between the two remaining Commissioners, Mr. Runciman, the President of the Board of Agriculture and Fisheries, and Mr. G. G. Leveson-Gower. The supervision of the Crown forests other than Windsor and of the more important Crown woods will now be committed to Mr. Runciman, with the object of bringing their administration into closer co-operation than has hitherto been possible with the work of the Board in regard to the development of sylviculture and forestry.—[*The Field.*]

WOOD FLOUR.

The United States Consul at Christiania, Norway, has given in his report some uses to which wood flour is now put. The flour is ground in a cheap mill, very similar to those which grind corn and rye. Pine and spruce sawdust is used in Europe, and after passing through the stones and the bolting chest, it is sacked or baled for shipment. It is then worth £2 8*s*. to £2 12*s*. a ton.

The flour has a number of uses. It is the absorbent for nitro-glycerine, which is the explosive ingredient. Wood flour dynamite is inferior to that made with infusorial earth as the absorbent; but it serves many purposes, and is cheaper. But dynamite is one of the smallest prospective uses for the product. Linoleum makers mix it with linseed oil, and give body to their flour coverings. It is not considered quite equal to ground cork for this purpose, as it is less elastic; but it is cheaper, and meets requirements for medium grades.

The flour fills an important place in the manufacture of xyolite, a kind of artificial flooring, resembling wood in weight, and stone

in other respects. It is used for kitchen floors, and in halls, corridors, cafés, restaurants, and public rooms. It is impervious to water, and is practically fireproof. It is floor material in some of the German war vessels. It is so used because it is not liable to take fire or splinter if struck by shells.—[*Timber Trades Journal.*]

MEDICATED SAW-DUST.

Medicated saw-dust is prepared thus :—A sackful of pine-wood saw-dust, coarsely sieved, is medicated with the following mixture :—Two buckets of water charged with oil of tar, 2 pints; mercuric chloride, 60 grains; ammonium chloride, 60 grains:—*Brid. Med. Journ.*, December 30th, 1911, 1720.—[*Pharmaceutical Journal.*]

BAMBOO HATS: A GROWING INDUSTRY.

A growing industry and one that promises to experience a steady growth in the future is the manufacture and export of bamboo hats, which has received a remarkable impetus since that passage of the Payne-Aldrich Bill providing for the free admission of these hats into the United States.

The following article on bamboo hats is taken from "Reciprocity and the Philippines," published by Mr. Harold M. Pitt :—

Among the lesser industries of the Islands is the manufacture and export of hats made of bamboo. This is an industry that is carried on in the homes of the natives of certain sections of the islands, and the work is all done by hand.

France is the best customer for these hats, and in 1909 took 227,603, valued at $73,327 out of a total exported of 440,842 valued at $142,480. The Payne-Aldrich Bill provided for the free admission of Philippine products into the United States, and opened up a new market there for these hats, and in 1910 there were exported to that country 176,938, where in the preceding year there had been but 12,169. The total exports in 1910 increased to 600,486 hats, value $276,309.

As the hats are very favourably received wherever introduced and are comparatively cheap, the industry is one that will

probably experience a steady growth. The material for their manufacture is found in almost every section, and as the demand increases the industry will doubtless be more generally introduced among the people, thus adding in a substantial way to their earning capacity The making of these hats does not interfere in any way with the agricultural pursuits of those who are engaged in the work, as the women and children devote their spare time to it.—[*Manilla Bulletin. Indian Agriculturist.*]

NOTES.

Redistribution of Conservators' Posts.—We see that Assam has lost a Conservator's post now made over to the newly formed province of Bihar and Orissa. We have little doubt, however, that Assam will be able to put up a strong case for regaining its second Conservator and that any such representation will be carefully considered. The progress of the Forest Department in Assam has been marked since the creation of a second Conservatorship there, and it is unreasonable to suppose that any check to this progress will now be permitted.

Grass Pulp.—The services of Mr. Raitt, paper-pulp expert, have been re-engaged for a further period of 6 months or thereabouts in order to continue his investigations at the Forest Research Institute.

Separate Provincial Service Direct Entry Course at Dehra Dun.—We would draw the attention of our readers to the announcement made by Sir Robert Carlyle in his address to the Forest College students, printed in this issue, that this course will begin in November next, and although the time is short, it is trusted that Local Governments will not delay in getting their candidates ready for it.

This will probably mean the immediate abolition of the 3rd Year's Course, and we understand that this is now under the consideration of the Government of India, as also what procedure is to be followed in the case of men who would normally have come up for this 3rd year. Orders are expected to issue very shortly if not actually issued before these remarks are in print.

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INDIAN FORESTER

JULY, 1912.

FOREST LOANS.

It has more than once struck us that Local Governments and Administrations are not always obtaining the revenue that they have a legitimate right to expect from their forests, the reason being twofold, first in that they meet all capital expenditure that has to be incurred out of revenue, and secondly that a considerable share of the profits goes to the middleman. It is open to question whether the methods employed of working and improving the forests, in other words, the broad lines on which our forest policy is based, are justified from a financial point of view, as being the best possible in the interests of the owner. It would not be considered businesslike on the part of a commercial company to be continually devoting a large portion of its earned income to capital expenditure thus benefiting the shareholders of the future at the expense of those of the present.

It is not difficult to imagine the outcry that would be raised if railways, steamship companies, land trusts, jute mills and other commercial undertakings, instead of paying their shareholders the dividends that they had the right to expect, threw a large part of

the profits into the concern, thus increasing its capital value for the benefit of the shareholder of the future, and yet this is what the Forest Department is doing every day. If any firm or corporate body finds it expedient to raise additional capital so as to permit of improvement in, or expansion of, working with the object of paying increased dividends, how does it proceed ? We have only to look at the commercial or financial columns of the newspapers and we see that for such purposes borrowings are continually being resorted to. The methods of floating and paying off such loans may differ, but the underlying principle, *i.e.*, the raising of working capital by means of loans remains the same. Thus to improve a harbour a port trust loan is advertised, to render a desert fertile an irrigation loan is placed on the market, while large commercial companies raise loans under the name of debentures, thus making those who are to reap the benefits of the designed improvements pay their fair share towards them. The duration of these loans is various, they may be perpetual, repayable in a fixed number of years, from a sinking fund, or gradually by means of drawings—this is a detail. We represent a *quasi* commercial department, and on the analogy of what is daily taking place in the commercial world, we should like to see the principle of forest loans scrutinised with a view to its acceptance. We can see no reason why Local Governments should not be authorised to raise such loans for the creation, permanent improvement and development of forests and forest industries. We admit that up to the present we can quote no precedent, but on the other hand can see nothing against the adoption of the proposal. Working on loans the administration of the present would derive a larger income and legitimately so, resulting no doubt in the income of the future being smaller, since the future as well as the present would have to pay interest charges as also its fair share towards the fund for the redemption of the borrowings that may be necessary. In the event of the principle of forest loans being accepted by the Government of India, it is perhaps not unreasonable to hope that they would themselves lend the money at a low rate of interest. If this were not agreed to then we see no reason why the loan should not be placed on the

open market secured on the forest or general revenues of the province.

Such loans might take the form of short term borrowings for a particular object or they might extend over considerable periods, as the case might be. The object of a short period loan would, we imagine, usually be the opening up of a comparatively small, though well defined forest tract, at present inaccessible or whence the existing difficulties and rates of transport render the sale of produce unprofitable, a good example being the construction of a tramway or some other method of mechanical transport as a means of export, or a large sawmill to convert timber in some particular forest whence in its unconverted state its extraction is not feasible—or again, a short period loan might well be issued for the experimental establishment of some forest industry under the guidance of an expert on a commercial scale, with a view to it being placed upon the market once its money earning capacity had been proved, and with the object of encouraging similar enterprises. We would instance an experimental rubber plantation, a factory for manufacturing tannin extracts, plant on a commercial scale for the manufacture of saleable by-products by destructive distillation of wood, etc. In all these instances repayment of the loan would naturally be made on the disposal of the undertaking. Long period loans might well find their justification in the creation, extension, permanent improvement and actual continuous exploitation or development of large forest tracts, as also in the establishment of some forest industry on a large scale that the Department for special reasons intended to keep in its own hands, *e.g.*, the manufacture of turpentine and colophony.

To enlarge on this point—what naturally suggests itself as a good example in connection with long period loans for the creation and extension of forests is the creation of irrigated plantations or the extension of existing ones for the supply of small timber and fuel to the countryside, there being this further indirect benefit that by a supply of fuel at a cheap rate, the cowdung so often substituted for it will be available for use as manure whereby the agricultural value of the land will be

enhanced. The Punjab furnishes instances of what can be done in this direction. Should water not be available, plantation projects might still be indicated in some localities from which to draw, in addition to a supply of fuel, material for some special industry, such as bark for tannin extracts. No doubt other instances will suggest themselves to our readers. Passing to the betterment of our forests large sums are annually spent out of revenue on various cultural improvements which often yield no direct and early return, though they undoubtedly increase the capital value of the forest estate. Such improvements might well be carried out on a greatly extended scale were capital, to pay for supervision and labour, available. Loans for this purpose would not perhaps appeal to Local Governments to the same extent as loans for schemes expected to yield an early return, but they would, we consider, be justified from a sylvicultural point of view. Burma would seem to offer a wide field. Loans for the exploitation and development of a forest tract on a large scale would be more attractive. In Burma again, for example, there are large areas of "Pynkado" and "In," at present awaiting the lumberman, the working out of which, not now undertaken for want of transport facilities which are expensive, of establishment to supervise and of labour, might well be spread over a long period, and which, looking to the increasing demand for sleepers and building timber, must prove of service to the industries and enterprises of the country. Another instance presents itself to us in Assam where somewhat recently forest tramways have been initiated on a small scale to tap comparatively limited areas where otherwise the trees would often have been left to deteriorate and perish. In that province there must still be immense tracts untouched, to extract the produce from which will be required considerable initial outlay such as the Local Government would find it difficult to meet from revenue, even if this course were justifiable, *e.g.*, perhaps the Nambar forests. Again the North Andamans island possesses virgin forest in which padauk is the principal species of value. Once the demand for this timber is assured, there can be little doubt that a long period loan on a large scale to admit of it being worked

continuously over a sequence of years would be a commercial proposition worthy of the most careful scrutiny.

What is required is a series of well thought out projects for the extraction of timber on a considerable scale from difficult localities and for the experimental establishment of forest industries under expert management on a commercial basis, involving perhaps the appointment of a Forest Engineer to work in co-operation with a Forest Officer placed on special duty, to formulate any likely schemes. On such schemes being approved there seems to be good cause to bring them into being by means of Forest Loans.

At the beginning of this article we noted that revenue was being lost by allowing a considerable share of the profits of working to go to the middleman. This indicates in certain cases the expediency of direct departmental working. There can be little doubt that in some provinces a very considerable income is being foregone by working through middlemen or contractors. The Burma net forest revenue is, we believe, some 66 lakhs of rupees. We have heard it stated on excellent authority that it would considerably exceed 80 lakhs of rupees at a moderate estimate, if recourse were to be had to departmental working. Is any Government justified in giving away this large difference to the middleman? We think not. The objection will no doubt be raised that with the existing staff any extension of departmental working is not possible. We grant this, but why should not the staff be increased and facilities improved? Men are available, elephants can be procured, while mechanical means of transport are not unknown. We admit at once that our existing staff is wholly inadequate and would have to be strengthened and placed on a par with what would be kept up by commercial firms, it is probably inadequate for the departmental working that we actually undertake, let alone any extension of this: to illustrate our meaning we would ask our readers to compare the staff that the Bombay Burma Company maintains when working out a forest, mostly men of high education and ability, with what we are able to provide under similar circumstances. One is working on

commercial lines while the other has not even the means of doing this, if it wished to. Or to take a second example showing how we have worked a forest industry and how a Company works it. It is, we believe, a fact that when the South Burma rubber plantation was worked direct by the Department, our controlling staff consisted of one Extra Assistant Conservator; we are informed on very good authority that since its sale to a Company there are no less than six Europeans connected with its working and possibly more, it is improbable that employment is given to these men out of pure philanthropy. Thus it is self-evident that the Department cannot undertake departmental work on a large scale without putting down considerable capital for staff, means of transport and for various contingent expenditure. To raise this capital we hold that loans would be amply justified. If the working were continuous, *i.e.*, moved yearly or periodically from forest to forest, the extra establishment required would be kept on, and its members would become adepts at their work. They would form the Executive Commercial Forest Staff (and as an incentive to good work might well be given a percentage on the profit), quite distinct from the professionally trained staff which would consist of officers technically educated in Europe or India as now existing, paid perhaps on a relatively higher scale, and who would form the sylvicultural or scientific branch of the Department. In order to work on the lines suggested the working-plans of the various forests would very probably require modification, one comprehensive working circle would replace several small ones, and perhaps one plan embracing a large area of country would have to be substituted for several of the existing ones with a view to the concentration of work, this rendering supervision easier and extraction cheaper.

In making the above suggestions we must not be taken to advocate departmental working in every case. In many parts of India there would be no advantage or profit in eliminating the middlemen or contractors, who often exist in considerable numbers, a fact which in itself is a guarantee of fair competition and of good prices being obtained. Each of these contractors has often the

command of a small labour force and of a limited transport, he knows the various local centres of consumption where the demand very possibly varies from year to year being at no time perhaps very considerable, and is in a far better position to supply and handle these than the Forest Officer. Here the middleman meets a real want and deserves every encouragement.

The question of Forest Loans is one of considerable magnitude and much both for and against no doubt remains to be said, quite beyond the scope of a short article. We should like to see the subject well ventilated in our pages and will welcome correspondence. We should still more like to see a Local Government in the interests of its forest development place a concrete case before the Government of India which would then have occasion to review the policy that we have rightly or wrongly for long accepted, namely that capital charges must be met out of income, and that the further improvement and development of the forest estate must depend on the extent that the necessary funds can be made available from the forest revenue of the province.

POSSIBLE MARKETS FOR CERTAIN FOREST PRODUCTS.

The difficulty of bringing the producer in touch with possible consumers of forest products, for which there is not at present a recognised market, is often a difficult business. This is not surprising as often the Forest Officer, who is in this case the producer, cannot get into direct touch with possible purchasers, who may live far away from the area from which the produce in which they are interested is obtainable.

Another difficulty is experienced in this connection, which arises after a possible purchaser has been put in touch with the local Forest Officer. Owing to the Forest Department's obvious inability to store any timber or minor product for which there is not a regular demand, an enquiry made by a firm for a certain product cannot be complied with promptly, so that the question of supplying the material for which an indent has been made often

falls to the ground and not infrequently the prospects of a very useful business for the above reason come to nothing.

It is by no means easy to overcome this difficulty, except possibly in the case of valuable timbers for which there is only an irregular market, but which can be stored in seasoning sheds and be supplied as demand arises.

The question of putting the officers of the Forest Department in touch with possible purchasers can in a measure be overcome, especially when firms or private persons make enquiries of the Conservators, by their forwarding such indents to their Divisional Officers for disposal or when the enquiry is made of Inspector-General of Forests or of the President of the Forest Research Institute by their taking the necessary steps to inform the local Forest Officers in whose forests the timber or minor product grows of the enquiry having been made.

Another way of dealing with the question is to keep the Department and the commercial world informed of the new uses found for the various timbers or minor forest products for which there may or may not be purchasers, but which in any case have been found to be of use for certain purposes.

It is proposed to give below a few details concerning a limited number of forest products about which enquiries have lately been made and which it is hoped may possibly lead to the disposal of forest products for which there is at present little or no demand.

I.—TIMBERS FOR RAILWAY CARRIAGES AND TRUCKS.

The inside fittings of 1st class railway carriages in India are generally made of either teak or of more ornamental woods, such as Bird's-eye maple or Australian silky oak for the panelling, with pillars and mouldings of blackwood, Andaman padauk, sissoo, etc., etc., or not infrequently foreign timbers. It is thought that certain Indian timbers could be used in the place of foreign timbers for panelling, such as satinwood, *Carallia integerrima*, *Gmelina arborea*, or even *Anogeissus latifolia* which when cut on a true radial section presents an extremely handsome wavy appearance.

Sample logs of satinwood and *Gmelina arborea* have recently been sent from the Central Provinces to the Superintendent of the Carriage and Waggon Department, Ajmer, R. M. Railway, to be given a trial in this respect. As the logs sent are still seasoning the results are not yet available.

The species of timber utilised for the mouldings, pillars and inside fittings of 1st class bogie carriages in India are not infrequently ornamental timbers chosen from the darker coloured woods in order to show up the lighter silver-grained panelling. Such species as sissoo, blackwood, Andaman padauk, walnut and teak are frequently used, as also ornamental foreign hardwoods. Timbers such as *Dalbergia Oliveri*, *Albizzia* spp., *Pterocarpus macrocarpus*, *Berrya Ammonilla*, *Terminalia bialata*, *Melanorrhœa usitata*, or any other fairly dark, ornamental timbers would probably be accepted by the Railway carriage builders who now have to pay high prices for foreign and the best ornamental Indian timbers to meet their requirements.

The tendency at present is to replace the old type wooden truck by trucks made entirely of iron. For ballast trucks, however, the bottoms of which are subject to so much wear and tear owing to loading and unloading of sharp edged broken ballast, wood is still largely utilised for the purpose. The timber employed in Northern India, and possibly elsewhere, is sal, a most suitable timber but yearly becoming more and more expensive for the purpose. It is probable that were other fairly durable and especially tough timbers brought forward for this purpose they would be readily accepted by the Railway authorities concerned. In this connection it is proposed to send sample logs of *Terminalia tomentosa*, *Lagerstræmia microcarpa* and *Terminalia paniculata* to the R. M. Carriage Works for trial. There are many other timbers which deserve a trial in this connection such as *Terminalia myriocarpa*, *Lagerstræmia Flos-Reginæ*, *Lagerstræmia tomentosa*, *Careya arborea*, *Anogeissus latifolia*, *Schleichera trijuga* and a host of other hardwood species might be mentioned, provided they are fairly durable and especially tough, while the appearance of the timber and even its weight are of minor importance.

Any Forest Officers wishing to find markets for timbers which they cannot at present dispose of, and which they think might be suitable for any of the above-mentioned purposes, would do well, as a commencement, to send a few really sound, and if possible, seasoned logs for trial to the Superintendents of any of the large Railway Carriage and Waggon Works such as exist at Parel (G. I. P. Railway), Ajmer (R. M. Railway), Lilloah (E. I. Railway), Insein (Burma Railway), Lahore (N.-W. Railway), Lucknow (O. and R. Railway), Madras (M. and S. M. Railway), Kharagpur (B. N. Railway), Kanchrapara (E. B. S. Railway), etc.

II.—TIMBERS USEFUL FOR TOOL AND MALLET HANDLES.

Some specimens of timber were recently sent to the Jamalpur Works of the East Indian Railway to be tested for mallet and tool handles. Up to that time ash handles were imported from Europe for the purpose at very stiff prices. Amongst the species of timber sent for trial were specimens of *Anogeissus latifolia* *Gmelina arborea* and *Lagerstræmia parviflora*. All were passed as suitable for the purpose, but the Workshops prefer the former about which they give the following report :—" It gives equally good results with English wood and has so far exhibited no defects for the purpose named."

The amount of timber required for such a purpose might at first sight appear to be insignificant ; on the other hand, it must be remembered that from 20,000 to 25,000 tool handles are required annually by large workshops such as exist at Jamalpur, of which at least 8,000—10,000 handles are up to 3 ft. in length, namely those used for sledge hammers, and fire and coal-shovel handles. To shape such handles with flange-head and handle from one piece of wood requires a block about 5" × 5" × 36" in size or roughly ½ c. ft. timber, so that the amount required to produce 10,000 handles would be 5,000 c. ft. of sawn material for the larger handles only.

It appears reasonable to expect that similar Railway Works or other places such as coal mines, etc., in which large numbers of tool handles are annually required would also be willing to utilise

the above-mentioned species of timber for such purposes, were the case properly put before them and the necessary facilities given them in order that they might first test the timbers.

III.—PENCIL WOODS.

A variety of timbers have recently been tested for pencil-making in India of which none can be said to be ideal for the purpose. Probably the best timber for the purpose, so far as is known, is *Juniperus macropoda*, next in order of utility to this species comes *Cupressus torulosa* which makes up into a fair to good pencil. *Podocarpus neriifolia*, *Cedrus Deodara*, *Wrightia tomentosa*, *Pinus excelsa* and *Pinus longifolia* have all been passed as suitable for pencil making but are all somewhat tough for the purpose.

A cubic foot of wood can be made up into about two gross of pencils and the price that can be paid at the factory for the most suitable classes of timbers which make up into the better class of pencils is from 12 to 14 annas per c. ft. in fair-sized logs and 6 to 8 annas per c. ft. for small billets.

To run a moderate-sized factory 18,000 c. ft. of timber are required annually. There exist at present a few small to moderate sized pencil factories in India, such as the Small Industries Development Factory at Tollygunge, the Bengal Pencil Factory both near Calcutta and the Gujerat Pencil Factory, Broach District, Bombay Presidency ; while one is reported to be starting in Dharwar and the erection of several others is contemplated.

IV.—MELANORRHŒA USITATA OR THITSI DAMMAR.

The result of Mr. Puran Singh's note, published in Vol. I, Part IV of the Indian Forest Records, on this subject has resulted in no less than twenty-six enquiries being made within a few months from Europe for this product. The difficulty in bringing these enquiries to a satisfactory conclusion has been in finding agents in Burma who deal in this commodity. Were any firm found who would be willing to stock *Thitsi* dammar there appears every reason to believe that enquirers would be forthcoming to purchase this natural varnish.

Complete data as to outturn are not to hand, though fairly large quantities are known to be available from the Katha Division in Burma. Mr. Blandford, the Deputy Conservator of that Division, has submitted a most interesting report on the subject, in which he gives the rough estimate of the possible outturn as 13,500 viss per annum (1 viss = 3·6 lbs.). The actual amount of 'Thitsi' which came into Mandalay in 1909-10 was 1,077 viss, but this figure is considerably below the total amount available.

V.—OIL-SEEDS.

The enquiry as to the possibility of utilising certain oil-seeds obtained from trees growing in the forest has been going on for several years. It is by no means an easy matter to bring such enquiries to a successful termination, though there now appears to be a fair prospect of obtaining definite results with a few species of oil-yielding seeds.

The only oil-seed which is at present exploited from the forests in commercial quantities is that of *Bassia latifolia*. There are, however, several spice or drug-yielding seeds obtained from forests which are annually put on the market, while many seeds of other species are collected for the oil they yield, but their use is generally limited to the local requirements of the agricultural population living in the vicinity of the forests from which they are obtained.

The difficulties usually experienced when attempts are made to exploit oil-seeds from the forest are—that the collection is expensive, owing to the scattered distribution of the species from which the seed is collected; that the Forest Officers cannot find time to carry out the work departmentally, so that local contractors have to be employed who are not infrequently unwilling to take up a new business of this nature, and that the possible purchasers lay down terms, such as the expression of the oil on the spot or the decortication of the husk, which cannot be complied with by the local contractor. Another condition which is generally necessary before an oil-seed can be exploited commercially is that a very large annual supply of seed is necessary—a condition

which can only be fulfilled by very few species growing in our forests.

The question of placing the seed of *Schleichera trijuga* on the market has received considerable attention lately, as the oil obtained from the 'Kossum' seed has been tested for soap-making by the North-West Soap Factory, Meerut, and found most suitable for the purpose, while Smith Stanistreet & Co., Calcutta, have indented for 500 maunds a month of this seed, which it is understood they require for the preparation of glycerine.

Samples of this oil were expressed by the Forest Chemist who found the ratio of the kernels to husks as 1 to 1·17, and the percentage of oil in the seed to be 56 per cent on the total weight of the seed or 25 per cent by weight of the kernel. These results were obtained by expressing the oil in a small hand hydraulic press; had the oil been expressed in a large hydraulic press working on commercial lines and the seed been treated in a hot state the percentage of oil obtained would have been higher. The latter statement is based on a chemical analysis carried out by Dr. Walter Leather, at Pusa, with seed submitted to him for trial in which he found 64·73 per cent. of oil present in the kernels. To form an idea of the amount of oil obtainable from oil-yielding seeds, it may be stated that in an up-to-date hydraulic press, treating the seed hot, within 12 per cent of oil in the seed can be expressed.

The oil-cake obtained by expressing the oil from the Kossum seed was sent to Pusa for report and passed as suitable for feeding cattle and also for manurial purposes. Kossum is a very common tree in certain forests of the Central Provinces, in the drier parts of the Bombay Presidency and also in some forests of the United Provinces, so that there appears to be a good opening for this oil provided an enterprising Forest Officer wishes to push such minor produce. To do so it would be necessary to work out figures of outturn and cost of landing the seed f. o. r., and then to consider whether it would be best to export the seed to the market or express the oil on the spot. To carry out such work departmentally is in most cases not possible, so that a local contractor would either have to be employed by the Department to collect the seed

and land it on a line of export or the contractor would have to be put in direct touch with possible purchasers, and carry out the work at his own responsibility. The price which purchasers can afford to pay for the oil cannot be stated with certainty, though were a Forest Officer to consider the possibility of working out the seed, such figures would be available on application being made to the President of the Forest Research Institute and College, Dehra Dun.

Another seed which promises to be of interest to the commercial world is that of *Mesua ferrea*, or Nahor, which is found to grow abundantly in the Assam Valley. This species has the advantage over the 'Kossum' in that the seed is large and heavy and therefore requires fewer seeds to make up a unit of weight, while Nahor grows far more gregariously than is the case with the Kossum tree, thus greatly facilitating the collection of the seed. Again the percentage of oil yielded by the Nahor seed is even higher than that from Kossum seed, having been found to contain, by the Reporter on Economic Products, as much as 72·9 per cent of oil in the kernel, as against 64·73 per cent in the case of 'Kossum.'

The oil obtained from the Nahor seed is of a yellow to red-brown colour. Samples of the oil have been sent to several firms for report, and though no answers have as yet been received, it is thought that the oil will be found suitable for soap-making and also possibly for the preparation of glycerine.

Large quantities of this seed are obtainable from the Lakhimpur and Sibsagar Divisions in Assam, as also from elsewhere. Were Forest Officers desirous of having a commercial test carried out by expressing the oil in a powerful hydraulic press, it is thought that such a trial could be arranged for in one of the large oil-mills in Bengal.

Enquiries have been made in recent years for the seed of *Hydnocarpus Wightiana* and *Taraktogenos Kurzii*, the oil obtained from which is said to be in request in England as a cure for leprosy. Any Forest Officer in whose forests these species occur and who wishes to find a market for these seeds would probably do so either by addressing any of the wholesale Chemists in Calcutta,

Madras, Bombay or other large trade centres or by informing the President of the Forest Research Institute to whom enquiries of this nature are generally addressed by wholesale Chemists.

VI.—CANES.

Canes are much in request all over the world for a variety of purposes, such as furniture work, drag ropes, sporting requisites, basket-making, fishing-rods, walking-sticks, umbrella-handles, etc., and though large quantities are extracted annually from certain Forest Divisions to meet this demand, it is thought that as the possible supply is in many cases far in excess of the present demand, a further development of the trade might well be encouraged.

The difficulties which present themselves in this case are similar to those which arise when attempts are made to put any other minor product on the market, namely, the difficulty in putting the possible consumer in touch with a local agent or contractor who would be willing to exploit the canes. In localities where canes are already exploited in considerable numbers, there must necessarily be persons who carry on their business, but in places where canes are not exploited for the market the difficulty of getting a man to take up such work is not infrequently nearly impossible.

The best chance of increasing the demand appears to be by supplying, in the first instance, samples of canes to any enquirers free of cost and on a definite offer being made by such persons to try and induce a local contractor to take the business in hand, by giving him the first year's outturn free or at a nominal cost.

As instances of inquiries made for canes, it may be stated that the Basel Mission, Cannanore, Madras, are making attempts to obtain supplies of canes from Bengal and Assam, though whether they have found what they want is not known. A firm in Sialkot, manufacturing sporting requisites, are making similar enquiries, while Messrs. Fernandez and Rovirosa of New York are making enquiries for canes for furniture making.

In conclusion it may be stated that every attempt will be made by the Forest Research Institute to put consumers in touch with

suppliers, or attempts made to find new uses for forest products on application being made in this connection ; on the other hand, it cannot be guaranteed that such attempts will always be successful as the difficulties of carrying such enquiries to a successful conclusion are manifold as has been pointed out elsewhere in this note.

R. S. PEARSON, I.F.S.,
Forest Economist.

15*th April* 1912.

ON THE UTILIZATION OF FIRE-LINES.

Not so very long ago a controversy existed on the respective merits of the two classes of fire-lines respectively known as 'Open' and 'Covered' or in some places as 'Pucca' and 'Katcha.' Forest Officers are aware that the difference lay in the 'Open' fire-lines being cleared of all trees, while in 'Covered' fire-lines only the small trees, shrubs, herbs and dry leaves were burnt. The 'Open' or 'Pucca' fire-lines have so completely won the day, that in many districts no other kind of fire-line is known. There is little doubt that where we are dealing with forests, like the majority of those in India, which consist of trees shedding their leaves during the very time of the year when it is most important to keep the lines clean, covered fire-lines are difficult to maintain. Not only this, but the shade of the trees is usually not sufficiently dense to suppress grass, the annual firing favours the growth of the grass, and the overhead shade impedes its drying, so that it will not burn before the adjoining forests are themselves in an inflammable condition.

Where we have large compact areas of forest with only a few lines running through them the loss of area from such fire-lines is comparatively insignificant. But the loss of area becomes a very serious matter where fire-protection has reached a high grade of intensity, and this is especially the case in forests with good and deep soil which grow, or are capable of growing, a valuable crop. There must be a limit to which we can cut up forests by fire-lines. Up to a certain point we are justified in

increasing and widening our lines in valuable forests and cutting it up into far smaller areas than in poor forests. In the latter the expenditure on fire-protection may not justify us in isolating blocks by fire-lines of possibly less than ten square miles in area, the limit laid down by Mr. Dansey in some Bengal forests. In other more valuable forests, so far as the proportion of expenditure to the total assets from a fire-protected crop is concerned, we are justified in isolating by means of internal fire-lines and fire-traced roads, very much smaller areas. But in such cases the area of land thrown out of production soon becomes important. In many cases I have found forests of little immediate present value cut up by lines, open fire-lines or fire-traced roads, into areas of only four square miles or less. This is evidently not justifiable as the expenditure on fire-protection eats up the whole of the profits.

It does not seem to be realised that every area of four square miles isolated by fire-lines 100 feet wide means a loss of close on 100 acres (96·7 acres). In small forests of only three or four square miles in extent where all boundaries have been cleared to 100 feet wide and perhaps a wide fire-traced road runs through the middle, the loss of area may be equivalent to a whole year's coupe of the working circle of which it forms a part.

There are other important objections to numerous open fire-lines and roads with open fire traces. These lines are frequently run along either side of a stream causing the drying up of the latter. In the case of roads, oxen and bullock drivers and all concerned in the management of the forests or the extraction of the produce are fully exposed to the sun, a matter of no small consequence in the hot season.

I have no wish whatever to re-open the controversy of open and covered fire-lines, at least on the old lines. Experience has finally decided that in deciduous forests the open fire-lines are more serviceable to fire-protection than the *ordinary* covered lines. But the time has come to consider the utilization of the numerous fire-lines and fire-traces, ultimately to decrease the expenditure on them, and make them a source of comfort and profit instead of a dead load on the forest revenue. In nearly all our better and

more valuable forests trees which give a good shade and are evergreen in the hot weather months can be grown with ease. Many of these trees are already ruthlessly felled along our cleared fire-lines especially in valley forests. The proposal is, then, to plant up the fire-lines with such trees, and especially such as are in themselves *valuable*. Many of them yield good timber, others fruits, and yet another the best kind of lac. Why should the fire-lines with good soil not be utilized for plantations of such trees? In many cases the Forest Department has lost much money on cultural operations scattered about in the forests on account, to a great extent, of their inaccessibility to supervision. The very location of some of these sowings and plantings is lost from the want of sufficient method in carrying them out and surveying them. But the locality of all fire-lines and fire-traces is well known, they are themselves lines of communication and daily patrol, the very presence of a labour force on them in digging holes for the young plants in the cold and hot weather would be useful, the clearing of the jungle threatening the young plants in the rains and cold weather would at the same time be the clearing of the fire-line, the dense shade of the old trees would effectually prevent the growth of any grass, no leaves would fall during the hot weather, travelling along the shady forest roads and lines in the hot weather would be a pleasure, and finally the trees and their produce would form a valuable asset, especially in times of famine.

Critics will at once say that the picture may be nice, but the scheme impracticable, because such trees will not grow along most of our fire-lines and roads. But let them consider the success of roadside planting in dry dusty districts absolutely exposed to every hot blast that sweeps across the open country and where the leaves of the trees are daily covered with layers of dust. Compare those conditions with what we can give on fire-lines sheltered on each side by a wall of forest, often along valleys, and the plants always put in several deep to ensure mutual protection. Compare the conditions even with some of our own cultural operations, where watering is out of the question, and where deer and pig so often browse on the shoots, whereas the traffic along roads and

lines will reduce this last damage to a minimum. Finally, many of the trees that we would wish to plant already occur *naturally* in the very forests where the lines are to be planted. Indeed, for years it has grieved me to see fine Mango, Banyan and Jamun trees ruthlessly felled along such lines whereas what is required is an avenue consisting of them. In every district it would be easy to draw up a short list of the trees suitable for fire-lines and road traces. In the damper forests of India the selection would be very large. If we take the ordinary plains and low hill forests of India, the following trees at once suggest themselves. I would in all cases recommend the planting about 6 feet or 10 feet apart and thinnings would take place as necessary.

(1) The Kusum tree (*Schleichera trijuga*).—This tree sheds its leaves in quite the cold weather, but comes out again into brilliant red foliage at the beginning of the hot weather and gives perfect shade at the hottest time of the year. Planting has frequently been suggested on account of its lac-bearing properties alone. Its timber is excellent. Its fruit is edible and its kernel yields an oil. This oil has lately been under investigation by Mr. Pearson, the Imperial Forest Economist, and by Mr. Puran Singh, the Forest Chemist. The seed yielded 25 per cent of oil with a cold hydraulic press, and its value has been variously estimated at 8½ annas to Rs. 11-8-0 per maund *in situ*. For commercial purposes it appears to be valuable for soap-making, for glycerine, and for oil-cake. It is worth over Rs. 12-8-0 per maund in Calcutta. The cost of collection at present, however, from trees scattered all over the country is necessarily very large.

Apart from commercial uses, both the aril and the kernel of the seeds are eaten (the oil-cake contained 22·3 per cent. of proteids and 14·4 per cent of soluble carbo-hydrates), the oil is largely used for cooking purposes, and is used in the treatment of certain skin-diseases. It is also said to be a good hair-oil.

The tree is very readily grown from seed which should be sown as soon as ripe. The young plants are easily transplanted and I have had them 3 to 4 feet high in their second year.

It is not suitable for cotton soils. Its best position is along valley fire-lines, especially near nalas, but it will grow, if watered for the first year or two, in any locality within its distribution.

(2) *Mango.*—The mango is wild in many valleys over Central India and Bengal and, as is well known, is easily grown along road-sides. Its wood is valuable.

(3) Banyan (*Ficus bengalensis*)—As a shade tree it is unsurpassed while the fruits are eaten by people in times of famine, and very largely by animals and birds. It is easily grown from cuttings. It naturally does best in valleys but will grow almost anywhere. Another fig tree (*Ficus glomerata*) is also in full leaf in the hot weather and has edible fruits. Seedlings of figs can be raised by throwing the ripe seed among damp brick rubbish and keeping this moist.

(4) Toon (*Cedrela* spp.)—De Candolle in his monograph has described a large number of species of *Cedrela* and another, *C. Hasleltii*, has been described by me as occurring in Chota Nagpur. All of them are in full foliage at the hottest time of the year. The wood is one of the most valuable for planks. The tree would be most useful on fire-lines at elevations over 1,500 feet on a sandy loam as in many places in the Balaghat and Bilaspur Divisions. I have raised the Central Provinces hill variety easily from seed even in Nagpur where it attained one foot in its first year, but it would probably not be suitable for general planting in the plains of those provinces and is quite unsuitable for cotton soil.

(5) Jamun (*Eugenia Jambolana*).—There are several varieties of this tree, possibly even two or more species mixed up under the one name, but they all agree in giving good shade during the hot weather months. The large-leaved valley variety also yields a comparatively large fruit. The wood is usually considered good. The hill variety will easily grow even on the more barren of our fire-lines.

(6) Nim (*Azadirachta indica*).—This beautiful tree grows in some of the forests of the Central Provinces as though it might possibly be indigenous. Certainly there would be no difficulty in growing it in most forests, but its greatest utility would be on the

cotton soil, where it grows to perfection and which is unsuitable to several of the preceding. Like the others it is in *full leaf* in the hot weather, and when well grown gives excellent shade. The wood is good. The whole tree is supposed to be germicidal and there is no doubt that it contains valuable antiseptic properties. The ripe fruits are largely collected for the oil which is especially useful in parasitic skin diseases and is also an anthelmintic. It is also a valuable camel fodder. It is best grown direct from seed without transplanting and, as it has few enemies, this is not difficult.

I believe that the above six trees are best suited to the dryer monsoon forests, but no doubt others could be suggested. Could we have avenues several feet deep on all our better fire-lines and fire-traces, the value of the forest property would not only be vastly increased but fire-protection would be rendered easier and less expensive, and the benefit of both man and beast in and adjacent to the forest would be very large. I look forward to the time when our timber cattle will be able to drag their loads along shady avenues, our elephants and camels capable of finding an abundant supply of fodder along every road, and travellers find shade and refreshment where now they toil along in the heat, and finally where Government will reap a large surplus of revenue instead of merely disbursing large sums on unproductive labour.

H. H. HAINES.

11th April, 1912.

A SHORT NOTE ON THE EARTH-EATING HABIT OF THE INDIAN DEER.

(BY PURAN SINGH, F.C.S.)

Some time ago, Mr. E. R. Stevens, Deputy Conservator of Forests, Ramnagar Division, United Provinces, sent to the writer two specimens of clayey earth from "Salt Licks" which bore the tooth-marks of the animals which had visited them, with a request for information as to what constituents the animals possibly obtain from them. One specimen was described as of a "clay salt-lick," and the other of a "sand stone salt-lick," the latter, it was stated, being very rarely met with. Following this Mr. B. B. Osmaston, Conservator of Forests, Western Circle, United Provinces, sent another specimen of a "clay salt-lick," together with two specimens of "deer droppings." Of the latter, one consisted of the ordinary goat-like droppings and the other of almost entirely of earthy matter, having been picked up close to the "clay salt-lick" from which a sample was taken by Mr. Osmaston. It was clear that the tooth-marks borne by the different samples of the "salt-licks" were those of the deer. The writer was informed by a friend, a sportsman of some experience, that he had often been to places frequented by *goral* and had seen them licking the earth. On tasting the clay of those particular spots, he found it distinctly saline.

The animals, at times, require a certain quantity of salt which, as is so well known, serves as a tonic and a stimulant. A good deal of salt required by their system, is derived from the food they take, but at times an extra quantity would seem to be essential.

Hence it is generally supposed that the deer eat clay in order to obtain the salt which it contains, especially as they are only seen licking particular spots in the forests.

Of the three samples of salt-licks examined, one gave no indication of saline matter while the other two gave a very slightly saltish taste when taken in the form of fine powder. The following table gives the results of the partial mechanical and chemical analysis of these three samples of earth :—

Table I.

Serial No.	Description of the sample.	Percentage of sand calculated on the air-dried material.	Clay silt per cent. on air-dried material.	Total aqueous extract per cent on air-dried material.	Percentage of common salt in the watery extract on air-dried material.	Percentage of common salt calculated on air-dried material *minus* sand.	Behaviour on moistening the powdered material.
1	Received from Mr. Stevens.—Appearance of a sand-stone when in lump, mixed with a yellowish clay. On powdering, it seemed to have the physical composition of a loam. The powder gave a very slightly saltish taste.	74·35	25·65	0·32 The residue gave a distinct taste of salt.	0·11	0·42	Emitted a sweet fragrant though somewhat earthy aroma; taste of clayey portion saline and more or less astringent.
2	Received from Mr. Stevens.—Appearance of a yellowish brown loam, tasteless.	71·37	28·63	0·22 No taste of salt.	0·028	0·097	Do. do. Appears to have no taste until the sand is removed.
3	Received from Mr. Osmaston—Appearance of a ferruginous clay of rosy ochre colour. When in suspension in water, the particles showed a red colour. The powder gave an indication of a saltish taste.	47·81	52·19	0·18 Distinct taste of salt.	0·06	0·11	Do.

In connection with the salt-lick, sample No. 3, the two specimens of "deer droppings" were examined with the following results :—

Table No. II.

Serial No.	Description.	Weight.	Sp. gr.	Loss on ignition per cent.	Ash per cent.	Soluble ash, on the total droppings per cent.	Insoluble ash on total droppings per cent.	Percentage of salt in the total "droppings" as determined in the soluble ash.
1	Healthy 'droppings,' appearance like goat excreta.	Numbering 14 in all, they weighed 8·4016 grms., the average weight of one being 0·6001.	0·748	87·94	12·06	0·51	11·55	0·09
2	"Droppings" of the deer that had eaten of the salt-lick No. 3 of the Table I. They were lumped together by twos and threes.	Numbering 16 in all, they weighed 35·8318 grms., the average weight of one being 2·2394.	1·697	11·36	88·64	0·92	87·77	0·079

From Table I, it is clear that the physical composition of Nos. 1 and 2 is similar, while No. 3 is more clayey. No. 1, when in lump, resembled sandstone, which, however, when powdered had the appearance of ordinary loam. It will also be seen that Nos. 1 and 3 are slightly saltish, and this was probably the attraction for the animals. No. 2 contains only 0·028 per cent of salt as compared with 0·11 per cent of No. 1 and 0·06 per cent of No. 3, and it seems comparatively poor in salt, though considering the quantity of salt contained in its clayey portion it contains almost as much salt as No. 3. The animals would be attracted by the saline clay that is contained in these sands rather than by the sand which in itself is tasteless. The quantity of salt, however, in all these samples is practically negligible, and it seems possible that the deer, like other animals, eat earth rather as a corrective to their system of digestion than for the salt contained in it. For example, it is generally accepted that elephants take mud to cure themselves of diarrhœa.

In this connection, it may be stated that Dr. H. H. Mann and Mr. D. Hooper have in their very interesting paper on "Earth-eating and the earth-eating habit in India" (*vide* Memoirs of the Asiatic Society of Bengal, Vol. I, pp. 249—270) discussed at length the abnormal taste of men and women for earth. The habit of eating earth by women, according to them, is occasionally found among almost every class and race of people. Clays, shales, alluvial muds, even sandy soils, are all used when once the habit is established. As to the cause of such a widespread habit they are inclined to attribute it primarily to the purely mechanical effect that the earthy matter seems to have in alleviating gastric or intestinal irritation. Gastric or similar irritation is inseparable from certain periods in a woman's life and these are precisely the periods when the earth-eating habit is contracted. In the same paper the medicinal uses of earth are discussed. Besides quoting the specific medicinal uses of small doses of earth given in oriental systems of medicine, a reference has also been made to a correspondence that appeared in the *British Medical Journal* on the subject. In the said Journal, a case was recorded of piles having been cured by

taking clay. A patient swallowed a bolus of about 1 drachm of yellow clay and next day he expressed himself as well. There was no abdominal pain, no diarrhœa, no blood, no heat or pain in the rectum. The same patient wrote that it was an old and common cure for piles and he knew it was always very successful. In another letter to the same Journal, it was stated that Hahnemann was the first to test alumina physiologically showing that it had a very decided action on the rectum and anus, producing constipation and symptoms of piles, which has provided homœpaths with indications for its use in these affections ever since. The general opinion expressed in the *British Medical Journal* appeared to be that its action is purely mechanical and analogous to that of bismuth and that the effect attributed to it—removal of pain and diarrhœa—is quite possible and solely due to the excessively fine state of division of the particles. The reasons given by Messrs. Mann and Hooper for the habit of earth-eating by men are :—

(1) A peculiar fascinating odour and taste in the clay rendering it a delicacy.
(2) An unnatural craving due to disease.
(3) To satisfy hunger.
(4) The force of example, and
(5) The supposed medicinal virtues.

Of these causes, some at least may be quite applicable to animals also, specially Nos. 1, 2 and 5. All the three samples of salt-licks under reference gave, on being moistened, a very fascinating odour, and the taste of the wet and fragrant clayey portion of each sample after the sand had been removed seemed to be a peculiar " delicacy."

When earth is in certain quarters, considered a useful medicine for man, it stands to reason, that owing to various disorders of the digestive apparatus, the animal instinct would naturally go to it for putting the digestive apparatus right. It may be instinctively sought for by animals to cure pain, diarrhœa, dysentery or any other form of intestinal irritation.

In conclusion, the most probable causes of the earth-eating habit of the deer, that suggest themselves, may be summarised as

follows: (1) to increase the salt in their system by eating and licking more or less saline earth, (2) an instinctive attraction that they may feel towards earth when their digestive organs are out of order, especially for relieving intestinal irritation, and (3) their choosing particular spots of clay may be due to well-marked symptoms of taste and odour that some soils possess. There is no special ingredient in these soils, unless it is salt, traces of which are found in them, which can be said to supply any food material to the deer.

SOWING AND PLANTING OF EUCALYPTUS IN THE DEHRA DUN DISTRICT.

Two species of Eucalyptus were tried in 1910: the *citriodora* or lemon-scented, and the *globulus* or blue gum, the seed having been supplied to me by an Indian zemindar who desired to make a plantation of the trees on a newly-acquired waste land in the district, and asked me to grow plants for him.

I sowed part of the seed of each kind in boxes filled with leaf mould, and part in the ground in ordinary garden soil dressed with an allowance of the same kind of manure. The boxes were eighty-six in number, each measuring 17 by 10 by 5 inches; and the ground plot was 15 by 8 feet. The situation was under the broken shade of a row of pear trees in my garden, open to the north-east, so that both the boxes and the ground plot could receive the morning sun up to about ten o'clock, and be thereafter protected not only from the sun but also from the cold of the night (in early spring). The boxes were placed on stones about four inches high to save them from white-ants, and the soil in the boxes was level with the top to prevent seedlings from growing "leggy."

The sowing was made in the evening of the 5th March in the following manner: the boxes and ground plot were watered very liberally from a watering can, the seeds were sown immediately on the wet surface, and were covered over forthwith with a sprinkling of fine sifted soil consisting of garden earth and leaf mould half and half.

The air in the ensuing fortnight was clear with the warmth of early spring in the day, and the nights, though chilly, were not too cold.

On the fourth day from the date of sowing, the soil, both in the boxes and in the ground plot, seemed to need more moisture, and I gave it a fresh watering very carefully so as not to bring the seeds to the surface. On the seventh day (from date of sowing) thousands of seeds germinated in the boxes, both varieties equally well. I counted 200 seedlings in one box ; and as all the boxes were about equally well stocked, I estimated roughly that there were in the forty-three boxes sown with the lemon-scented kind about 8,000 plants and a like number in the forty-three boxes containing the "blue gum" species. There were thus about 16,000 seedlings in the eighty-six boxes. The seeds in the ground took a longer time to germinate : they received another careful watering, began to germinate on the twelfth morning from the date of sowing and continued coming out in the next three or four days, when the plot became as well stocked with seedlings as the boxes. Roughly stated, there were about 4,000 plants of each of the two kinds, or say, about 8,000 in all in the ground.

In the last week of March, or about twenty days from date of sowing, the seedlings of both kinds in the boxes were throwing out their second set of leaves ; they were almost two inches high, and both kinds were progressing equally well, the *citriodora* perhaps a little better. In the ground the seedlings of both kinds were less advanced ; they were about one inch high, their secondary leaves (when they came out) were smaller ; the plants were of smaller size than those in the boxes, but otherwise they were quite healthy.

About the 26th March, a thunderstorm burst upon us with rain and slight hail ; temperature fell suddenly, the nights became quite chilly, and there was much moisture in the soil. Within two days from this rapid change several young plants, principally in the boxes, began to droop, and within a week several hundreds of those in the boxes had died. On removing the boxes at the first sign of drooping to bring them out more into the open air and sunshine, I discovered three things : some of the drooping plants

had been struck by the hail, others had apparently suffered from too much moisture, and not a few had their roots eaten by white-ants which attacked them from underneath, and from the sides of the boxes (the sides were touching one another though the boxes were raised from the ground). The plants in the ground were slightly injured here and there by the hail, but were otherwise scarcely affected.

In the middle of April, that is, about a month and a half from the date of sowing, I transplanted one good specimen plant of each kind into as many good-sized pots, to see how they would stand transplantation at that early period of their growth ; and I took the opportunity of examining them, with the following results stated in inches :—

From the boxes—	Height.	Root.	No. of leaves.
Citriodora ...	3	$3\frac{1}{2}$	Two sets.
Globulus ...	$2\frac{3}{4}$	3	,,
From the ground—			
Citriodora ...	2	2	One set.
Globulus ...	$1\frac{1}{2}$	$1\frac{1}{2}$	,,

When placing the plants in the pots care was, of course, taken to keep their extraordinarily long roots in their natural position, a detail which Indians often neglect. The four pots were watered liberally, and placed beside the boxes and the ground plot respectively. Thereafter the same treatment was given to the whole undertaking, that is, the soil was kept moist without flooding, and excess of sun was avoided.

By the end of April the increasing warmth and dryness of summer had no injurious effect on the plants in the broken shade, either in the boxes, in the ground, or in the pots. The plants continued to make very satisfactory progress all through April and May.

At the end of the latter month the *citriodora* seedlings in the boxes were from five to seven inches high ; the *globulus* in the boxes were very little less ; both had a healthy breadth, and their leaves were very fine. I reckoned that there were now about 3,000 plants of each of the two kinds in the boxes. (I had started

with 8,000 seedlings of each kind as stated above.) In the ground plot both kinds were less, being about three to four inches high, and less broad; their leaves also were of smaller size, but the plants seemed hardier; and, roughly stated, there were about 3,000 plants of each kind (I had started with about 4,000 seedlings as stated above).

I now advised my friend, the zemindar, to arrange for the removal of all the plants to his estate a little before the beginning of the rains, to keep them there under the same conditions as in my garden, and to plant them out into their permanent location as soon as the rains had set in, care being taken to avoid rain-water lodging round the roots of the plants. The boxes could be carried bodily, and the plants in my ground would be potted under my supervision before removal.

Two unfortunate errors were made. The boxes were removed rightly enough on carts in the first days of June; but when two days later I visited the estate to see the permanent location, I saw to my consternation that nearly all the boxes had already been emptied, the plants had already been put into a wide nursery ground near a stream, and had been flooded with water according to the pernicious local habit! The result could not be anything but disastrous: and in a few days practically the whole supply of the splendid young plants from the boxes had perished.

The second error was made in the size of the pots for the plants in my ground. I had pointed out and explained the length of the roots and the necessity for suitably deep pots. To my disappointment, when about four thousand pots came, they were all less than five inches deep, they should have been seven inches. Into the limited depth the plants were potted in the first ten days of June and watered diligently every day; and such was their power of endurance in the limited space and the warmth of the mid-summer days (in this district) that not ten in a hundred had died when the rains began. But their progress was much impeded, and for fear of losing them they were kept under my charge until the beginning of July, when they were removed to the estate (both the *citriodora* and the *globulus*), and were planted out eight feet apart in chess-

board fashion suggested by me, and no depression was allowed around the roots.

It is now two years since they were planted out, and I learn that they have made a fairly large plantation, in which both the *citriodora* and the *globulus* are mixed up, the trees standing already from eight to fourteen feet high. Had the two above-mentioned errors not been made, the plantation might have been twice as extensive.

It would be unwise, from one trial, to draw conclusions for future guidance in sowing and planting Eucalyptus in this, or any other district in Northern India, though the results seem to indicate that what is needed are a good supply of leaf mould, deep tillage, broken shade, equable spring temperature, and moisture (without too much water) in the soil.

Another trial is in hand this year with the lemon-scented species, and I hope to send some notes later on.

DEHRA DUN : L. LIOTARD.
12th April, 1912.

ANTISEPTICS—*AVENARIUS CARBOLINEUM.*

Note on the antiseptic treatment of 400 *Pinus excelsa* (Kail) and 326 *Pinus longifolia* (Chir) B. G. sleepers with *Avenarius Carbolineum* oil at Jagadhri by Forest Economist.

1. *Size of tank used*, 11′3″ × 3′ 9″ × 2′ 10″.—This is too large and requires much oil to fill it sufficiently to flood the sleepers. It should be made 10′ 3″ × 3′ 3″ × 2′, a tank of this size will treat 6 sleepers at a time, which is as much as can be conveniently lifted by a compound pulley fixed at a tripod.

2. *Experiments made as to absorption.*—The figure within which it was proposed to work was 3 lbs. of oil per sleeper, at an estimated cost of 7·2 annas per sleeper. Six sleepers were weighed

of each species before and after treatment having been immersed for 10 minutes. The following were the results :—

PINUS EXCELSA.			PINUS LONGIFOLIA.		
Serial No.	Weight before immersion in lbs.	Weight after immersion in lbs.	Serial No.	Weight before immersion in lbs.	Weight after immersion in lbs.
1	117	122½	1	132	138
2	112½	115	2	127	132¼
3	144½	147	3	149	158½
4	93	95½	4	159	167
5	121½	122	5	141¾	149½
6	94½	97	6	147	150½
Total.	683	699	Total.	855¾	895¾

The absorption of oil by 6 sleepers of *Pinus excelsa* was therefore 16lbs. and *P. longifolia* 40lbs. So as to work approximately to 3 lbs. per sleeper the time of immersion was extended to 15 minutes for the former species and reduced to 5 for the latter; at the end of the work it was found that owing to the excessive absorption of Chir it would have been better to put the immersion period at 3 or 4 minutes.

3. *Temperature of oil.*—In the case of *Pinus excelsa* the temperature was kept at 80° C. or a little over. As this temperature in the case of *Pinus longifolia* appeared to cause the small cracks in the timber to expand the temperature was lowered to 50° C.

4. *Method of working.*—The tank was sunk nearly flush with the ground, and under it a flue was made, running the entire length of the tank, in which a fire was kept burning. Over a tank a tripod some 8 feet high was erected, to the top of which the upper pulley was fastened, while the lower one was furnished with stout hook. Two pairs of parallel sleepers were placed on each side of the tank and at right angles to it to receive the sleepers. The sleepers to be treated were made up in parcels of 6 and placed on each side of the tank so as to rest on the parallel sleepers. They were kept apart with battens laid horizontally between the upper

and lower three, and also vertical battens, with a notch at the top to keep each pair apart. Round each end a wire rope (1½" circumference) was looped, and connected by another wire rope furnished with hooks at each end which passed over the pulley hook. The first lot of sleepers was then swung into the tank and in order to sink them, a by no means easy business, the second lot was placed on the top. After the immersion period the top lot was removed and slung to one side of the tank and the treated lot hoisted, allowed to drip for a few minutes, and then slung to the opposite side of the tank and then removed to the stacking ground. The upper lot were then again slung into the tank and in their turn treated while a new lot was placed upon them to weigh them down.

The time taken to treat sleepers depended on the time of immersion, it was found with 15 minutes' immersion, it took 3 minutes to allow for drip and 7 minutes to remove and re-charge the tank, therefore 25 minutes in all to treat 6 sleepers. This was the average for several days' work. The *Pinus longifolia* sleepers were considerably heavier than the Kail sleepers, but absorbed the oil much faster. A mistake was made in calculating the total amount of oil necessary to treat 800 sleepers ; working on a 3lbs. per sleeper average it requires 2,400lbs. of oil and only 2,600lbs. were obtained, so that the 200lbs. margin proved insufficient, quite 800lbs. surplus was necessary.

5. *Labour.*—It requires 12 men to keep the tank supplied and two carpenters to slot the sleepers to receive the zinc numbers, to prepare battens, etc. The slotting was done before the sleepers were immersed and the stamping of additional marks two or three days after immersion, when the sleepers were thoroughly dry.

6. *Depth of impregnation.*—Directly the sleepers came out of the tank, the depth to which the oil had penetrated was found to be not more then $\frac{1}{16}$" on the sides and $\frac{1}{8}$" at the ends. The oil, however, continued to penetrate for several days after treatment. In the case of *Pinus excelsa* after 15 minutes' immersion and after 3 or 4 days the oil had penetrated $\frac{1}{8}$" to $\frac{3}{16}$" on the sides and $\frac{3}{8}$" to $\frac{1}{2}$" at the ends, in the case of *P. longifolia* with 5 minutes'

immersion it had penetrated $\frac{1}{4}''$ to $\frac{3}{8}''$ on the sides and $\frac{1}{2}''$ to $\frac{3}{4}''$ or even as much as 1" at the ends.

7. *Amount of oil actually used.*—2,789lbs. to 726 sleepers or 3·84lbs. per sleeper.

R. S. PEARSON,
Forest Economist.

25*th April* 1912.

REPORT ON FOREST ADMINISTRATION IN THE CENTRAL PROVINCES FOR THE YEAR 1910-11.

[*Contributed.*]

For some years past there has been a steady shrinkage in the area of State forest lands in the Central Provinces and Berar. During 1910-11 the fall was 52 square miles, but it appears that the bulk of this loss was due to "re-calculation of areas." Progress has, however, been made in getting rid of the "B-I class" reserved forests which were never intended for permanent retention on the books of the department and are now being surrendered for cultivation, and we are glad to note that steps are being taken to get rid of small patches of forest surrounded by village lands, as petty isolated blocks cannot be properly supervised and are a constant source of friction with the people. But when all projected disforestments are complete, it does not seem likely that the area of reserved forest will sink much below 20,000 square miles, or roughly one-fifth of the total area of the Provinces.

The Provinces are rapidly improving their position as regards working-plans, and two special officers, each with a gazetted assistant, were employed on this work throughout the greater part of the year. Plans are in existence, or are now being prepared, for about 86 per cent of the area for which they are said to be necessary, but it may be doubted whether some of the older schemes are of a practical nature, since we read in the report of coupes which contain no workable material, and of felling series which include inaccessible forests. It appears from Form No. 55 that in one Circle alone the prescriptions of several existing plans have been abandoned over areas aggregating 1,350 square miles

which does not look as if much skill and foresight have been devoted to their preparation. No doubt these lessons have been laid to heart, and practical schemes may now be looked for, prescribing fellings which can actually be made and coupes which it is possible to work. It is now the custom in these Provinces to depute an experienced Revenue Officer to examine a working-plan in detail in consultation with the Forest Officer who is preparing it, thereby ensuring a practical compromise between the wants of the people and the sylvicultural requirements of the forests. This excellent practice is worth the attention of other Provinces in which it has not yet been adopted.

Expenditure on roads and buildings was much the same as in the previous year, amounting to about seven rupees per square mile of forest area. It is disappointing to find that the Southern Circle, which of late years has been by far the most liberal of the three in its expenditure on roads, has shown a steadily diminishing revenue since 1906-07. The failure of outlay on roads to bring its due reward in the Southern Circle is probably due in great measure to what are described by the Chief Conservator as "road schemes which were undertaken without sufficient preliminary investigation, and which have now turned out to be more or less unsatisfactory and useless, after involving considerable expenditure." Steps are being taken to guard against such mistakes in future and to be ready with useful projects when employment has to be provided at short notice in times of scarcity. Expenditure on tanks and wells was about half that on roads, and includes the cost of an Overseer deputed from the Irrigation Department to help Forest Officers with tank projects. We cannot help thinking that a considerable proportion of the outlay on tanks might with advantage have been diverted to buildings or roads, since we still read of tanks which failed to hold water and bunds which were breached. It is to be hoped that the sites for these tanks are selected with due regard to the interests of the forests as well as to the convenience of the people. If tanks are provided in the centre of large waterless blocks so as to distribute the incidence of grazing by attracting cattle away from the over-grazed areas

near the villages, they may be of real and lasting benefit to the forests, but there is nothing in the report to show whether this obvious point is receiving attention.

Fire-protection was cheap and efficient, having been successful over 97 per cent of the area treated at a cost of Rs. 9-12-0 per square mile. It is to be regretted that, owing apparently to want of funds, not much more than half of the forest area of the Provinces is systematically protected against fire. More than four-fifths of the forests were open to grazing throughout the year, and the grazing incidence for the Provinces is said to be one animal for every 2·8 acres. There are, however, wide variations in different Divisions, the limit being reached in the "Pasture Lands" of Amraoti, where animals were admitted at the rate of five for every 3 acres. The Conservator describes the condition of these grazing grounds as "very deplorable," and states that "it appears impossible at present to devise any method of even maintaining the present scanty grass growth, much less of improving it . . . . every green blade is eaten off as soon as it appears while much grass is torn up by the roots, with the result that the growth of grass is weakened and the finer species are replaced by coarse varieties." His proposal that "these areas should not be called upon in the future to supply grazing to a larger number of cattle than now resort to them" does not sound a violently radical one, but even this modest suggestion has been vetoed, as it appears that any form of limitation would amount to a breach of faith with the people, who have been given a moral right to destroy the provision made for them as quickly and as thoroughly as they think fit. It is perhaps not too much to hope that this lamentable object lesson will be laid to heart, and that unwise concessions of this nature will cease in the Central Provinces and elsewhere. Attempts made during the year to encourage stall-feeding of cattle have unfortunately failed, and it appears that in normal years the people have little use for fodder grass even when offered practically free. As 45 per cent of the animals which entered the forests in 1910-11 obtained a whole year's grazing for the nominal payment of one anna each, it is not surprising

that their owners preferred to send them out to fend for themselves. Further efforts are to be made to encourage stall-feeding, and it seems that they are to be supplemented by a general rise in the grazing rates, so the result will be watched with interest.

Frost, which probably does more damage in the Northern Divisions than all other causes of injury combined, was experienced in the end of January, but serious damage was only done in a group of three Divisions in the extreme west and one in the centre. Insect attacks on teak and sal are reported, but do not appear to have been very wide-spread or dangerous. It is now recognised that in certain types of forest light grazing is actually favourable to seedling reproduction of teak and other species, and that in coppice forests the careful flush trimming of stumps has been much overdone in the past. In the case of sal and anjan *(Hardwickia binata)* it is admitted that flush cutting is actually harmful. The question is one which will have to be studied for each species separately, having due regard to the mode of issue of the coppice shoots. When the tendency is for the dominant shoots to be produced from the cambium, cutting at any appreciable height above ground level will result in giving the shoots a more or less unstable foundation. On the other hand, there are species, such as sal, which rarely produce a shoot above ground-level even when the stump is 6 or 8 inches high. For these it is obvious that flush coppicing is at the best a waste of labour, and may at the worst be a cause of serious injury.

The combined cultivation of field and forest crops has been continued in Berar, and as it now seems established that this system is well adapted to conditions prevalent in the Central Provinces, we might expect to see it tried in the other two Circles. Other sowings and plantings have been on a comparatively small scale, and have not as a rule met with any striking success. Our readers may remember an article in the *Forester* of September 1909, the writer of which advocated the cultivation of aloes on fire-lines as a means of increasing their efficiency as well as a source of considerable profit. This suggestion was apparently acted upon in the Northern Circle, but it has not answered expectations as we are

told that "the plantations are of no use for fire-protection and of no commercial value."

There has been a satisfactory increase during the year in the area under systematic fellings, as well as in the outturn of major and minor produce. The gross revenue rose by Rs. 57,234 and amounted to just under Rs. 100 per square mile, while the value of free grants and concessions to the people exceeded Rs. 20 per square mile. The surplus stands at Rs. 4,82,068, or 24 per cent of the gross revenue. The waning revenue from the Southern Circle has already been alluded to, and it appears that this Circle actually worked at a loss of over Rs. 35,000. Several reasons are assigned for this disappointing result, but it is not easy to understand why the Southern Circle should not have shared to some extent in the increased prosperity of the other two, and the problem is to be further investigated by the Local Government.

The report as a whole shows steady progress, and the department is obviously doing as much for its forests as present conditions permit. Most of the Central Provinces forests can never have been valuable or luxuriant even at their best, and still require many years to recover from the ruined state in which they were received. The task is at times a discouraging one to the forester who can see but little tangible result of his own labours, but hopeful signs are already appearing and continued effort will eventually reap its due reward.

OBITUARY.

Mr. C. E. BRASIER.

We print below two notices received from Madras Forest Officers of the death of Mr. Brasier, late Conservator of Forests, Madras, which show the great esteem in which he was held in Southern India :—

(1)

"We regret to have to record the death of Mr. C. E. Brasier, Conservator of Forests, Madras, within a few days of his retirement.

Mr. Brasier passed the entrance examination for the Forest Department in 1879 and ought to have come out to India in 1881, but the Medical Board put him back for a year on account of varicose veins, and he actually commenced his service in 1882. He served for a short time in South Arcot and Chingleput districts, and in 1885 was posted to Tinnevelly, where he remained until 1892, when he was transferred to Salem. In both these districts he did magnificent work, abolishing the destructive permit system and introducing regulated working. A hard-working, indefatigable Officer, he spared neither himself nor his subordinates, among whom he earned the *sobriquet* of "the tiger." He had a great gift for finance and for circumventing the untrustworthiness of the lower ranks of the Department. On one occasion, writing to obtain a large contract for the supply of fuel to the Madras Railway, he drafted a tender and sent it into office to be fair copied in the usual way; in this tender he entered a rate a few annas in excess of the rate he was prepared to supply the fuel at; a couple of days before the date fixed

for opening tenders, he wrote out his 'tender No. 2,' entering a rate a few annas below that of his first tender and posted it himself. When the tenders were opened all the native contractors were found to have tendered an anna or two below his first tender, showing that they had bought information from his office, but his 'tender No. 2' successfully swept the board.

He became Conservator in 1901, and in this capacity served in all three circles of the Madras Presidency; he went home on furlough in 1910 and had just sent in his papers when news was received of his untimely death in the hunting field at Lyndhurst."

(2)

"On the 19th of March by the death of Charles Edward Brasier, killed in the hunting field, the Madras Government lost one of the ablest of its servants and the Madras Forest Officers a most devoted chief.

Educated partly at the Tours Lycée and partly at Wimbledon, Brasier entered Nancy in 1879 and passed out high enough to be selected for the Punjab Cadre. He then had the ill-fortune to be put back for a year to undergo a long and expensive hospital treatment, and on being finally passed was posted to Madras. The first eight years of his service were spent mainly in the Tinnevelly and the next eight in the Salem District. He then acted as Conservator, and five and a half years ago became senior Conservator in the Presidency.

In Tinnevelly he did wonders, and in Salem even greater wonders. In both he introduced the coupe system of localised fellings (of which he was the pioneer in Southern India), whereby order was evolved out of chaos

and the Capital and Interest of the growing stock safe-guarded.

But it was perhaps as an administrator that Brasier achieved his greatest victories. When he arrived at Salem towards the end of 1891 he found himself in charge of 1,400 square miles of forest spread over 8,000 square miles of Revenue District. Much of it—the sandal area—in broken almost unknown country, without a bungalow, without a road.

Looting was rife and corruption the order of the day. There was little demarcation or settlement and no working-plans.

But his stern dogged persistency and indefatigable industry at once rose to the occasion.

He made a rapid tour through every part of his charge, in order to get his knowledge first-hand, and then waited for his friends—the dishonest contractor, the avaricious sandal merchant, and the underlings in their pay. He gave them rope and they took it, soon they regretted it, and the jail population swelled.

Before he had been long in the district, Salem was perhaps the heaviest forest charge in India. Selection, demarcation, and perambulation of proposed reserves, supply of many thousand tons of fuel annually to the Railway, road-making, bungalow construction—later on the preparation of working-plans—and above all, a crusade against sandal theft and corruption of every kind. These were his tasks and the fruit of his inexhaustible patience and unceasing watchfulness was to be seen in the state of the district when he left it—taken as a whole, the most efficient and advanced in the Presidency.

The revenue had risen from under a lakh and a half to well over three lakhs.

The staff had been very greatly increased, comparatively comfortably housed, and had had every reason to realise that integrity and industry were the main paths to success.

As a young man, Brasier was a great walker—no day was too hot or too long for him. He would start off at cock-crow and come back by torch-light. The next day he would sit down in the early morning to his enormous pile of papers and work on till dinner time—and this not for one camp but for years on end. But in all the drudgery of his incessant toil his brain never lost its subtlety and his fixity of purpose never wavered. The stories of his victories over chicanery and fraud are endless—perhaps he was never really defeated. On the other hand, no honest and energetic worker ever had cause to regret service under him. More than one Sub-Magistrate and Provincial Forest Officer owes his position to-day to the development of character under a master-mind, and to the kindly and sympathetic interest subsequently extended by his former chief.

When Brasier became a Conservator, passing over the heads of many of his seniors, he, so to speak, emerged from his forests into the glare of official limelight. But he never blinked. He had to deal with larger questions and with officials of higher rank. His methods necessarily altered, but not his principles. He gave of his best, without fear or favour, and some of his despatches—of a terse and corn-treading purport—were perhaps not very palatable at the time.

But even those, whose theories and ideals were somewhat abruptly shattered, could not fail to be appeased

by the fearless honesty and by the hard practical sagacity of this strong man, of whom it might in all truth be said :

Justum et tenacem propositi virum,
Non civium ardor prava jubentium,
Non voltus instantis tyranni.
Mente quatit solida.

Socially Brasier was popular with all. With his keen sense of humour, genial bonhomie, and varied stores of information, he was an admirable host. To dine with him was an education in more ways than one. He had travelled in nearly every country in Europe, and also in America and Japan. He was devoted to France and spoke French fluently. The writer has often been asked for tidings of 'le bon Brasier-ce grand garçon' by his Nancy contemporaries.

It was from France that he acquired his great knowledge of the *cuisine* and his sumptuous camp dinners, even in the heart of the forests, were famous throughout the Presidency. No Cook ever twice imposed upon him a steamed leg of mutton and his faithful old Body-Servant Rungiah was an admirable lieutenant if need be.

Brasier was a keen, if not very proficient sportsman. As a young man he was slim and wiry and a noted runner. At one time he used to play tennis and billiards with more energy than success. He was fond of shooting, and in his later years he became an enthusiastic motorist.

He was never without a dog or two, but to horses and all that pertains to them he was mainly devoted. He was fond of racing and a close student of Form. He had a natural genius for Finance, and the shrewd acumen, that had stood him in such excellent stead in many an investment, rendered his race-going a profit both to himself and to his friends.

He had hunted much in Ireland, England and France, and was looking forward with the eagerness of a schoolboy to many years of the pursuit of the fox and wild stag. The irony of fate! He had sent in his papers only a few weeks before he met with the fatal accident that deprived many of us of a staunch and sterling friend.

He had no official decorations, but he won the undivided respect of the Service that is so much the poorer for his death."

"CHELA."

CORRESPONDENCE.

TO THE HONORARY EDITOR, INDIAN FORESTER.

1. "PODOPHYLLUM EMODI."

SIR,—In my article on "Podophyllum Emodi" published in the April issue of the *Indian Forester*, I find that the statement made by me in connection with the cultivation of the plant on p. 157 from line 11 to 16, needs some modification. In lines 13 and 14, p. 157, for "former" and "latter" is to be read "latter" and "former" respectively. The next sentence is to be read as follows :—

"The new rhizome begins to grow about two years after planting the sections, but it is only in the fourth and fifth years after this that the rhizome is fit for collection."

In this connection, I may say, that the information as to the time taken for the rhizome to be fit for collection is gathered from old and somewhat indefinite records. It is quite possible that the average time may be longer. This point will be cleared up when the experiments on artificial cultivation of this plant, which are being carried out at Jaunsar, are completed.

PURAN SINGH.

2.—FORESTRY IN NIGERIA.

SIR,—The enclosed extract from a critique in the "Outlook" of a book by E. D. Morel, entitled "Nigeria, Its People and Its Problems," is interesting since the work which is referred to in such glowing terms has been achieved by an Indian Forest Officer. Could not Mr. Thompson, the Conservator of Forests, Southern Nigeria, be persuaded by one of his friends in the Imperial Forest Service to write some account of the work he has had to do in Nigeria and the progress made in Forestry there since he took up the appointment about nine years ago?

G. P. M.

"A fine example of the line of policy Great Britain has adopted in Nigeria is provided by the Forestry Department in the south. The wealth of timber in Southern Nigeria appeals naturally to the cupidity of adventurers whose one object is to get rich quick at other people's sacrifice. The forests are being conserved at the same time that the native is being educated in their economic value. If concessionaires who would cut the timber away in Nigeria as ruthlessly as they have destroyed whole forests in America and Canada, are warned off, the native, on the other hand, has been trained to such purpose that the Forestry Department of Southern Nigeria is already revenue-earning. Think what has happened in the province of which Benin, the centre of every abomination known to slavery, is the capital. Thanks in large measure to the Forestry Department, the Benis have become prosperous and law-abiding, and cordially co-operate with the British officials in the maintenance of the laws which have brought them conditions of life to which they were strangers. Of the license-fees paid by European lease-holders of rubber plantations, they recently insisted that one-third should go to the Government, despite Government objections."

NATURAL REGENERATION IN FORESTRY.

ON no other subject connected with forestry has there been so much discussion as on the question of artificial *versus* natural regeneration. There are so many things to be taken into consideration when discussing such subjects, and as is usual in all arguments, too much stress is laid upon the advantages of the one system and the disadvantages of the other. This is particularly evident in most of the older works on sylviculture, so that the beginner may take up one book, and after reading it, become a firm believer in natural regeneration, only to go over completely

to the other side after reading a book by an author who favours the other method. Nowadays there are few writers who favour one way or the other, the safest ground being between the two. A German book which appeared in 1907 discusses all the various sylvicultural systems and methods of management with their merits and demerits, and concludes by giving the palm to that method of natural regeneration known as the strip system. We refer to *Die Grundlagen der Räumlichen Ordnung im Walde*, by Dr. C. Wagner, which reached a second edition in 1911.

The method of working the system depends upon the direction of the prevailing rain-bringing winds and the sun's rays. Dr. Wagner's aim is to combine as much moisture as possible with protection from the drying influence of the sun, and to carry out the regeneration in such a way that the timber can be taken out with the minimum of injury to the undergrowth. In addition, the working of it must be simple enough to be carried out by anyone of moderate intelligence.

A steady rainfall without much wind favours no particular part of a wood, so that it may be looked upon as a negligible factor. The decisive factor which makes all the difference on the borders of a wood (and it is on the borders that the regeneration takes place) is rain accompanied by storm and strong wind. As most storms in our part of the world come from the west and south-west, the strip of ground on the east border gets none of this additional moisture, whilst it is driven well into the west side by the force of the wind. The drying power of the sun's rays is exerted from the south-east, south, and south-west. In consequence, the east border, in addition to getting no additional water, is exposed to the action of the sun's rays for a considerable part of the day, and is rendered absolutely unsuitable for natural regeneration. The south and west borders get the additional moisture, but the afternoon sun evaporates most of it again, and for obvious reasons it would be unwise to attempt to rejuvenate high forest by starting from the west or south sides. The only borders which combine shade and moisture are those to the north-west and north, and they are at the same time well sheltered from

the prevalent storms. The north-west side is perhaps a little dangerous, but the north is absolutely safe, as it has the advantage of being protected from late frosts, as the plants remain dormant longer than when exposed to the sun and warm winds.

The superiority of the north border is the secret of the whole system. Dr. Wagner starts his regeneration from the north, by judicious thinnings in a long, narrow strip extending from west to east. As soon as the seedlings have got hold and are well established, the strip is widened and the timber on the first strip gradually removed. This process goes on through the whole wood, no part of the ground being laid bare until it is well stocked with seedlings, so that there is no danger of the whole wood being ruined by the failure of a good seed year, as so often happens when other systems are employed.

The method is similar to Gayer's strip system, but the strips are narrower (about half as wide as the height of the adjoining trees), and are themselves more or less uneven-aged, according to whether they have been regenerated in the course of one or of several seed years. Gayer recommends that the fellings be conducted against the wind, or, in other words, from east to west. Progress is more rapid by the latter method when seed years occur frequently, but as no advantage is taken of intermediate seed years, it may be very slow indeed. In Wagner's system progress can be hastened to any degree by working simultaneously from several lines of attack. The timber is always thrown towards the old wood, and can be taken out in the same direction, so that there is no danger of serious damage to the young growth. The wood, when completely restocked, presents a strange appearance, more or less like the teeth of a saw, the trees gradually increasing in size with advancing age, until the second line of attack, when there is an abrupt fall again to the seedling stage, followed by another gradual rise up to the third line, and so on.

Dr. Wagner claims that this system is preferable to all others in nearly all situations and for practically all kinds of trees. He gives a number of rules which must be followed in mountainous districts. There is no doubt that he has obtained excellent results

in his forest in Geildorf, South Germany, and there is no lack of supporters of his system in other parts of Europe. The system is certainly one of considerable merit, and ought to succeed well in the moist climate of the British Islands. It would be interesting to know whether any experiments on similar lines have been carried out in this country, and with what degree of success.

Dr. Wagner's system has its opponents as well as its supporters. We are inclined to think that he claims too much for it, as it is impossible to give one universal rule to fit all circumstances, and although we know of many woods where there would probably be no difficulty, we know of as many others, old pine, for instance, with a good thick layer of raw humus and weeds, where the system could not be a success. Mere theorists, who condemn the system because it relies upon natural regeneration, or for some other reason, do not deserve attention.—[*The Field.*]

THE IRRITANT ACTION OF SATINWOOD.

Two varieties of satinwood come into commerce distinguished according to their origin as East Indian and West Indian. The former is derived from *Chloroxylon Swietenia*, D.C., and the latter from *Zanthoxylum flavum*, Vahl. Both woods are used in cabinet and furniture-making, and in the decoration of ships' cabins, and for other similar ornamental work. In 1898 and again in 1904 there were complaints from workmen using satinwood in this country that it produced severe skin eruptions, and at that time a number of articles dealing with the skin irritation produced by satinwood were published by medical men who had come into contact with such cases (Jones, *British Medical Journal*, June 25th, 1904; Bidie, *ibid.*, January 14th, 1905; Graham, *ibid.*, April 15th, 1905).

At first there was some doubt as to whether one or both varieties of satinwood produced these effects, but in the *Annual Report of the Chief Inspector of Factories* for 1907 it is made clear that the outbreaks which have occurred in East London, Glasgow and Bristol, were all due to East Indian satinwood, and that the West Indian wood has not so far caused trouble of this kind.

The attention of the Imperial Institute was directed to this question in 1904 by Mr. J. Whitton, Superintendent of Parks, and Curator of Botanic Gardens, Glasgow, who forwarded small supplies of the wood which was then producing trouble of this kind in shipyards in Glasgow.

The investigation of both kinds of satinwood was undertaken at the Imperial Institute, and a short note on the constituents of the East Indian satinwood was published in this *Bulletin* (1909, 7. 93) fuller details of the scientific work being given in the *Transactions of the Chemical Society* (1909, 95. 964) in a paper by Dr. Auld of this Department. In this it was shown that the East Indian satinwood contains an alkaloid *chloroxylonine*, two resins, one amorphous and the other crystalline, and a fixed oil, and the chief characters of these substances were described.

The pharmacological action of the timber and of the constituents referred to above, prepared at the Imperial Institute, has been investigated by Prof. J. T. Cash, F. R. S. of Aberdeen University, and the results of his experiments have been published recently in the *British Medical Journal* (October 7, 1911).

Damp satinwood sawdust was kept applied to the arm for 15 hours daily. On the morning of the fourth day there was considerable irritation, with redness. The irritation increased, especially at night, and after six days, desquamation ensued, and was very evident for the succeeding ten days. Irritation continued at intervals for three weeks after its first development; it was worst after exercise, or under the influence of warmth. Sawdust moistened with almond-oil proved rather more effective in its action than that moistened with water, whilst the dry dust was less rapid than either of the foregoing in producing its action.

The alkaloid chloroxylonine and its salts (the hydrochloride and nitrate), applied either as an ointment or in alcoholic solution, proved, towards two out of three individuals, insidious but powerful irritants. In neither case was there any effect on the first application, but definite symptoms appeared after an interval of four days in one case and twenty-two days in the other, from the date of a second application. Subsequent applications acted with much greater rapidity.

Of the non-alkaloidal principles contained in East Indian satinwood, No. I resin, an amorphous substance soluble in alkalis, was not irritant to the skin of normal individuals. No. II resin, a crystalline substance sparingly soluble in alkalis, produced a slight irritant effect in one instance where there had been no previous dermatitis. The fixed oil, which is viscous, yellowish-brown in colour, and has a specific gravity 0·965, caused no irritation when applied to the normal skin. To individuals, however, who had already experienced a chloroxylonine dermatitis all three substances acted as irritants: No. II resin being very active, No. I resin moderately so, and the fixed oil slightly active.

No explanation can at present be suggested for the apparent immunity of one of the subjects of chloroxylonine application, but this is in harmony with what has been observed among satinwood workers. Thus Jones and others have pointed out that only some of the workers using this wood suffer in any way from handling it. Prof. Cash's results also confirm the observations previously recorded that certain workers appear to become much more sensitive to the irritant action of satinwood once they have suffered from dermatitis caused by this wood. On the other hand, no case was met with in these experiments in which a subject acquired a sort of immunity as the result of a first attack of dermatitis, though this has been stated to occur among satinwood workers.

A number of samples of this wood have been examined at the Imperial Institute since 1904, and the results show that about 50 per cent of the samples contain only traces of alkaloid. In other cases amounts varying from 0·013 to 0·07 per cent. have been found. This variation in the amount of chloroxylonine present no doubt accounts for the fact that outbreaks of satinwood dermatitis among workmen occurred only occasionally. The *Report of the Chief Inspector of Factories* for 1907, already referred to, indicates that the East Indian satinwood is less used than formerly, and that where it is used fans are employed to remove the sawdust, so that the latter does not come into contact with the faces and hands of the workers.—[*Bulletin of the Imperial Institute.*]

PINE FIBRE

During the last few years a new textile industry has arisen in which pine fibre, in the form of paper made from wood-pulp, is employed. An article on the subject, by C. P. Hellberg, of Sweden, has appeared in the *Textile Institute Journal* (1911, 2. 33). The paper is cut into strips, which are spun into yarn on a ring spindle. This paper yarn is said to be suitable for packing-twine and cords, whilst carpets made from it are already in great demand on the Continent. It can be combined with cotton for the manufacture of upholstery fabrics and workmen's aprons, and will doubtless compete with jute for the production of oil-cloth and sacking. The paper yarn is not damaged by water, either hot or cold.—[*Bulletin of the Imperial Institute.*]

COMPRESSED PAPER AS A SUBSTITUTE FOR WOOD.

The *Standard* refers to the extraordinary progress now being made in the adaptability of compressed paper, and states that an American engineer, now in London, has a certain secret adhesive process and improved machinery, which turns out, at a minimum of cost, almost every article that has hitherto been made of wood and a great many more things usually seen in earthenware, china, glass, or tin. A factory is at work in Gera (Germany), and similar factories are to be started in Paris and London. Specimens of manufactures include perfectly made barrels for packing any sort of provisions, including fish ; drums for chemicals, piping of every diameter, electric insulators, pots for chemists and druggists printing rollers, clothes and hat boxes, tool handles, and a dozen more different descriptions.

" There is nothing that we shall not be able to do with this compressed paper as soon as we have the necessary machinery," said one of the holders of the patents to the representative of our contemporary. " Not only are we going to revolutionise cost of manufacture, but also, thanks to the far lesser weight of the goods, all freight charges. In the case of chemists' jars, we shall also save in the breakage.

"All kinds of furniture, roll-top desks, bed-steads, chairs, motor car bodies, and even railroad vans are only a matter of sufficient plant—that is, machinery ; but meanwhile we shall content ourselves with turning out drums for chemicals, butter firkins, and multitudinous small articles, particularly pulleys of all descriptions and electric insulators. Wood is often costly, and is liable to warp and split according to atmospheric influences of heat or cold or damp. Compressed paper, under our process, never varies, and is absolutely impervious to cold or heat, damp or steam. I can show you pulleys which have been tested for three years over a steam vat : not the slightest impression is visible. These drums for chemicals are absolutely acid proof, and show a saving of 75 per cent. on manufacture as against iron, and just half the cost in freight. I will guarantee a saving of thousands a year to manufacturers using many cardboard boxes, and as for trunks—well, the only thing that comes near us is split cane ; but we beat split cane in durability and climatic conditions."

An important syndicate is in course of formation to acquire the patents in every country which have been secured by the American engineer, who regards his process as flawless.

Every goods barrel in these islands will have to be made of my compressed paper before many months pass, and in that industry alone—making barrels there are millions.—[*The World's Paper Trade Review.*]

THE USE OF ROSIN IN PAPER MAKING.

Rosin which, by the way, is now being produced in the Punjab, is an indispensable article for paper making, and in view of its constantly increasing price and the fluctuating of the market, a substitute has long been sought which will give the same results in paper sizing. In Germany the large price of £5,000 has been offered for a solution of the problem, but so far no competitor has come forward.

The Union of Paper and Cellulose Chemists has studied the question, but without finding any satisfactory solution, and it is not likely that the problem will be solved soon.

Several reports were read to the meeting of chemists at Berlin, and those of Dr. Klemm and Professor Schwalbe were very informative, both on the subject of the research for new rosinous substances and on the question of economising the quantities of rosin at present used. Both of these chemists suggested that the rosin should be helped out with other materials such as starch, casein and tanning size.

Resinous waste, a by-product in pulp making, has been tried in a paper mill in Sweden, but although this product, which has been called liquid rosin, has given fairly good results at this mill, its employment has not been generalised.

Dr. Klemm suggests especially for printings, mineral sizing by means of combinations of salicic acid with alumina, barium or lime.

In the majority of printing papers the aim of sizing is not so much to make the paper impermeable to water or ink as to serve to agglutinate the fibres in order to give more solidity and endurance to the paper. From this point of view mineral sizing should be even superior to rosin sizing, in so far as the fibres, the weighing materials, such as china clay, and the colours, are more closely combined, and, therefore, a better printing surface is obtained. Moreover, this method of sizing prevents the paper from turning yellow, which is an advantage in high-class printings.

The diminution of the use of rosin resulting from the adoption of these mineral sizes is not very large. Taking an average of 1½ per cent of rosin used for the 300,000 tons of printing paper made in Germany, the use of mineral sizes would save 4,500 tons of rosin, of a value of about £25,000. Dr. Klemm is confident that this mineral sizing will be adopted sooner or later in all paper mills making printings.

As for *artificial rosin*, the manufacture is an accomplished fact. Several chemists have produced a synthetic rosin by means of aldehydes and phenols, but this product is altogether too expensive, and the solution of the problem depends upon the question of price.

Professor Schwalbe reviewed the divers materials which might serve to size paper or to economise a part of the rosin,

He divided these into two classes in organic colloids, such as salicic acid and the hydrates of alumina, and organic colloids. The question is whether after use these colloids preserve their agglutinant qualities.

The organic colloids are very numerous and may be classed under four heads : those which are soluble in water ; those which swell up under the same influence ; those which form emulsions, and substances soluble in alcohol. Gelatine belongs to the first group, and this is already used in paper making. Fish glue and several vegetable gums could be used more or less for sizing, but they are out of the question, as they are dearer than rosin.

The substances which swell up include starch, gum tragacanth, mucilages and seaweed preparations. These have been tried in paper making, but without any great success, either because of their high price or by reason of imperfect preparations. Viscose also belongs to this group ; it gives a solid paper, but not always impermeable to ink.

Several preparations of cellulose might very well be experimented upon.

The third category includes substances insoluble in water and not susceptible to swelling—that is to say, rosin, fatty matters and waxes. In order to be used in sizing they must be able to form an emulsion, which will remain unchanged while the paper is passing over the drying cylinder. Rosin itself is the type of this class ; it forms an emulsion in the state of free rosin either by the aid of soap or by other well known methods.

There are certain exotic substances which might be tried in a state of emulsion, but their price will be an obstacle in paper mill use, even supposing that they are capable of replacing rosin.

As already stated, artificial rosin is too expensive. An American inventor, Mr. Baekeland, produces artificial rosin by using six molecules of phenol and seven molecules of formaldehyde, so that it is evident this would be much dearer than the natural product.

The fourth class of colloids consists of substances saponifiable with an alkali ; these deposit an amorphous precipitate on the

fibre. Soap itself might be used, but its high price is against it, and casein is in the same category, and this also costs too much. Already in the case of special papers colloid matters dearer than rosin have been used with it, but the problem to solve is, if not to supplant rosin, at least to find a cheaper substance to use with it.

Tannin size and silicate of soda seem to fulfil the conditions. A mixture of sulphate of alumina with sulphate of magnesium or with free sulphuric acid can replace the first of these products, and is much cheaper.

But this is a palliative only, not solution of the problem. Of the various substances mentioned only the inorganic colloids and the mucilaginous bodies are worth considering. The former may be used for printing papers, but it is feared that the latter will only partially fill the desired conditions.—[*Oil and Colour Trades Journal.*]

FIBRE SANDALS.

A very important industry is carried on in Spain in the manufacture of a sort of a sandal or slipper known by the name of *espadrille*, which is in general use among the poorer classes, and is also exported in large quantities to other countries. According to a United States Consular Trade Report the total number exported to Cuba, Algeria, Argentine, Italy, France, Mexico, Panama, Philippines, Porto Rico and other countries amounted to 403,439 dozens in 1909.

They are made of plaited soles of jute or hemp cord about a quarter inch thick. To this sole is sewn an "upper" piece of cotton canvas, rather lower in height than a shoe, and it is attached by tapes fixed to the upper edge and bound round the ankle. The favourite colours are white, black, red, blue and dark-grey in the above order. There is a very large home consumption in Spain, which is supplied by small workshops distributed in the industrial quarters of all Spanish towns. Barcelona alone possesses 209, Madrid 94, and Valencia 78, where the work is either entirely by hand or machine-made parts are put together by hand.

In addition there are factories for the manufacture of soles by machinery, but the development of automatic machines similar to those used in the boot trade progresses very slowly. Espadrilles are nevertheless made very cheaply and are sold at from Rs. 3 to Rs. 3—7½ per dozen pairs or from 7½ to 9 annas retail per pair.

The cheapest have jute soles, and a better quality have soles of hemp and sell from 10 to 15 annas per pair. Workpeople are paid at the rate of Re. 1-4-0 for men, 15 to 18 annas for women, and 11 to 13 annas for children per day. Workers make from two to three pairs per day, men making the large sizes, women the intermediate, and children the smaller ones. In the Basque Provinces the production is estimated at 10,000 to 12,000 pairs per day.

Here is an industry that might, with every prospect of success, be taken up in India. All the materials are produced locally. Woven soles of cotton are a well-known product of our jails, the espadrille is suitable for people who object to wear leather, and there is abundance of labour of a suitable kind, for the work is much more easy to learn than handloom weaving. The tools are those of the mochi, but, as leather is not used, there can be no caste prejudice against the work which might find occupation for agriculturists in the enforced intervals of field work. Raw materials could be distributed and the finished articles collected in villages by the same organisation as serves the handloom weavers.

A rival material for the same footwear for indoor use is paper, which, when cut, spun and woven, makes mats and cloths of various qualities. For the manufacture of soles it has the advantage of being a good non-conductor.—[*Indian Textile Journal.*]

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PYINMANA FOREST DIVISION: TEAK AND BAMBOOS IN BURMA.

I.—General Remarks.

1. The object in view in writing this paper is twofold: there is first of all a desire to re-awaken the interest in the flowering of bamboos which was aroused some years ago over the Kyathaung (*Bambusa polymorpha*); and secondly, as a result of a study of the flowering of bamboos, to suggest that a stronger line should be taken in respect to fire-protection, and that in the present exceptionally straitened financial condition of the province, as a temporary measure at least, all or nearly all the expenditure on fire-protection in Pyinmana and in other divisions where similar conditions prevail ought to be diverted to other works of development and improvement, which are being starved for want of funds.

2. How much is known and how much is buried away in office records as to the distribution and flowering of bamboos it would be hard to say. My own case is probably typical of many. After adding the few facts I have gleaned for myself

in the forests to what I have picked up in the Pyinmana office, in annual reports and in the pages of the *Indian Forester*, I am still hopelessly at sea over many important details. There are no maps showing the distribution of any species of bamboo other than *kyathaung* (and that only a rough tracing on a small scale). The *tin* (*Cephalostachyum pergracile*) has flowered gregariously over the whole division at intervals during the past 30 years, and yet I am reduced to guess work and to questioning villagers in order to trace its course. There is not even a map of the burst of gregarious flowering that took place in 1907 and 1908. Two minor bamboos, *myin* and *wannwe*, are now in flower, but I can only guess at the area likely to be affected.

3. The idea has long been current that *the flowering of bamboos is the key to the solution of the problem of teak regeneration in bamboo forests.* Until quite recently I did not realise in the least what was meant by the expression and passed it by. Now that I know, and am fully convinced of its truth, the subject has become of absorbing interest which I would like to communicate to others before going on leave.

The subject is not given anything like the attention it deserves. If it is the key it rests with us to make it fit the lock, or rather it rests with us to fit all the keys represented by all the important species of bamboo in Burma. Endless time will be lost if the business is not tackled systematically, and if it is not given a prominent position all to itself. Fragmentary remarks in annual reports are certainly not good enough.

It is first of all essential that all known information be brought together and published, so as to be within the reach of all foresters in the province. It is equally important that an organised attempt be made to fill up the blanks which at present exist in our knowledge of the habits and distribution of the bamboos. It remains to be seen how best to carry out this idea. A provincial conference would probably be the simplest way of settling details. May it soon meet!

4. Everyone knows how exceptionally gloomy the financial outlook is at present. Exceptional conditions call for exceptional

remedies. This is my excuse for venturing to suggest that we are justified in moving faster in respect to the abandonment of fire protection undertaken for the sake of regeneration.

In the selection of all areas hitherto brought under protection from fire, regeneration is all that has been thought of. Prevention of damage to trees and timber has only come to the front in recent years, and, more often than not, simply to bolster up the case for regeneration protection. The two matters ought to be treated quite independently (para. 31). It only obscures the real points at issue to try and deal with both together.

In the memorandum which appeared in the *Indian Forester* for December 1906, Mr. Beadon Bryant went so far as to condemn utterly continuous fire-protection for the sake of regeneration in moist forests, but before coming to a decision with regard to the less moist and dry types, he wished to have a series of experiments started. As more than half the protected forests are of the moist type one would have expected to see a marked decline in the area under protection in the past five years. Here are the actuals :—

Year.	Area under protection.	Cost A VIII f.
	Sq. miles.	Rs.
1906-07 ...	8,153	2,89,701
1907-08 ...	7,527	2,73,468
1908-09 ...	7,457	2,57,081
1909-10 ...	7,728	2,92,130
1910-11 ...	7,468	2,67,481

The inference seems to be that we have rather lost sight of the real point at issue. Whilst waiting for the results of experiments in dry forests we have overlooked the fact that the case has already gone definitely against continuous protection of moist forests. Rather an expensive mistake, it is true. Well over five lakhs already, and mounting up at a lakh or more a year!

Now that continuous protection even in dry forests is on its trial, ought not the whole of our operations to be looked upon as a gigantic experiment? Once this is recognised, the next step is obviously to reduce the operations to the dimensions of an experiment, and not to allow them any longer to usurp a position to which they are not entitled.

Another point: as it is very doubtful if continuous protection will prove to be good even in dry forests, and as we are so hard up for money, why not start a break in the continuity of the protection now?

Lastly, it is a mistake to suppose that the burning of a forest in Burma means undoing much of the effect of the previous protection. The *sal* forests of Northern India are in a totally different position to the teak forests in Burma. The former fit in with the ideas we brought from home, the latter do not. Most of the leaves shed in the Burma forests disappear absolutely in the following rains. Teak and bamboo leaves certainly do. At the most, therefore, the burning of such forests would only put the clock back a couple of years, and probably only one if the burning were done early. A realisation of this fact may come as a surprise to officers who have not previously thought about it, and should help to remove the objection some men have professionally.

5. Perusal of forest administration reports for the past five years is sufficient to bring out the need there is for a stronger line being taken with regard to bamboos and fire-protection. Expenditure on the latter for the sake of regeneration ought to be limited to those areas in which there is a reasonable probability of its being beneficial. It would not be unreasonable to go a step further and to ask that it be limited to the class of areas in which it proved to be an unqualified success.

The gregarious flowering of *tin* has been almost as widespread in the Southern Circle as in the Northern Circle. In the latter, experimental burning was started in 1906-07, and following years. In 1910-11 in one division alone 242 square miles of forest was thrown out. This certainly looks as though the business was getting beyond the preliminary experimental stage. Nevertheless

since 1907-08 the Southern Circle has been marking time in respect to flowered *tin* and fire-protection. It would indeed appear to have gone backward, 190 square miles of forest has been added in Minbu to the area under protection "in accordance with the provisions of the Taungdwingyi working-plan." I wrote that working-plan, and, at the time of doing so, had only been in Burma two years and had seen little or nothing to lead me to re-adjust the ideas on fire-protection learnt in the *sal* forests of Northern India. The word *wathon* had not been added to my vocabulary. Five years have gone by, and I have now no hesitation whatever in saying that my plan is not itself sufficient justification for increasing expenditure on protection—(see also remarks in para. 12).

6. My chief object in writing this paper is to discuss the flowering of *tin*. I should not have gone into print at all if I had not hoped to take leave shortly, and I should certainly not have brought in anything about fire-protection, if my enquiries with regard to *tin* had not convinced me that nine-tenths of the expenditure on fire-protection in Pyinmana is not only waste of money but actively harmful. I am firmly convinced that wherever *tin* has flowered in Pyinmana within the past 30 years, the effect of our protection is exactly the same as if we had spent the money on hiring men to hack at all the young teak they could find in *wathon* areas, and for the divisional officer and his assistants to spend a good deal of their time in seeing that none escaped. A good deal of the balance of the divisional officer's time has been taken up with enquiring into fires, running people in for starting them, and writing reports deploring the damage done! Are we all puppets in a burlesque?

In the *Indian Forester* for April 1912 is an article by Mr. Walker on "Sylviculture in Burma". Thanks are due to Mr. Walker for the courageous way in which he has put forward the case against protection during the past 10 years. Mr. Walker winds up his article with a very striking phrase:—"*The retention of fire-protection may have been forced upon us in spite of our wishes and experience.*" Is this true?

II.—Flowering of the Tin Bamboo.

7. The Burmese name (*tin*) for *Cephalostachyum pergracile* is so short and convenient that I hope to be excused for using it freely. The Burmese for seedling bamboo growth (*wathon*) is also so much shorter than its English equivalent that it is frequently employed.

8. In the *Indian Forester* for September 1904 there is an article on "Reproduction of Teak in Areas of Flowered Bamboo" which is well worth reading. I refer to it for the sake of the following extract:—

> "But I have often wondered why there is this interminable writing about and this interminable waiting for the flowering of a particular bamboo, when many others, spread over areas at least as extensive as those occupied by *kyathaung*, are ignored. Why are no schemes prepared for *tinwa* which extends over enormous areas both in Upper and Lower Burma, and the gregarious flowering of which I have myself witnessed on more than one occasion; or for *myinwa* (*D. strictus*) which flowers yearly to a greater or less extent in almost every division in which it is found; or for those bamboos which are found gregariously in one or two divisions only? From the day the Forest Officer enters Burma he is taught, unintentionally no doubt, but none the less surely, to look upon the *kyathaungwa* as a thing apart, instead of merely as one of a kind, with the result that numberless opportunities for studying by actual experiment the effects of different methods of treatment in areas of flowered bamboo have been lost, frequently without comment. Let us then cease this endless writing about the flowering of kyathaung and accustom ourselves to think about the flowering of the *bamboo*; let us evolve some scheme of work for the reproduction of teak in flowered bamboo areas which will become as much or even more a part of the routine work of the Forest Officer as fire-protection or the preparation of working-plans."

* * * * *

Thittaw-Wunmin.

I don't know who "Thittaw-Wunmin" is, but I am none the less pleased to come across his article because it affords confirmation to the very same opinion that I had already formed myself. The *tin* in Pyinmana is a case in point. It has flowered all over the place, and fire-protection has enabled it to choke off all teak regeneration, and yet we have made absolutely no attempt to tackle it or to experiment with it. All I can find is a string of elaborate proposals for experiments with it *in order to be beforehand with the flowering of kyathaung*. These experiments never came off. We have sold our birth right and got nothing for it; all because the deal was with the modest and unassuming *tin* instead of with the much vaunted *kyathaung*.

Further, a good deal of the *wathon* which I took at first to be *tin* is really *wannwe* (*Oxytenanthera albociliata*); a species for which I have never heard of any plans being made although it is worse than the big species where it exists. And there are many others. "Thittaw-Wunmin" is quite right. Our schemes must include and apply to all kinds of bamboos. It is not safe to leave out any of them.

9. The depreciation of the *tin* is largely due to its close association with the *kyathaung*. In point of size the *kyathaung* with its 90 feet stems of 15 inches girth does tower over the little *tin*, which cannot rise beyond 70 feet by 10 inches and does not average more than 60 feet by 9 inches.

Another reason why *tin* has attracted so little attention is that, years ago, the idea was started that it flowered sporadically. Brandis in "Indian Trees" divides bamboos into three classes according to flowering, *viz*: (1) annual; (2) periodic and gregarious; (3) irregular or sporadic. *Kyathaung* is given as an example of the second class; *tin* and *wannwe* of the third class.

The following references to the flowering of *tin* are taken from Circle annual reports for the past 20 years:—

1892-93	... Tharrawaddy	...	5 years before in Kon-Bilin.
1894-95	... Ruby Mines	...	15 years before in the Shwele.
	Lower Chindwin	...	Sporadic flowering.
1896-97	... Ruby mines	...	Sporadic flowering in Nanpaw.

1900-01	...	Myittha ...	Flowering in Taungdwin.
1900-05	...	Upper Chindwin ...	Extensive flowering in the past few years.
1905-06	...	Do. do. Myittha Katha	... Universal flowering.
1906-07	...	Toungoo ...	Gregarious flowering in Gwethe and Kabaung.
1906-07	...	Pyinmana ...	Gregarious flowering over a large area.
1906-07	...	Northern Circle ...	"The *tinwa*, the chief associate of teak in Upper Burma, apparently began flowering in the northern part of the Upper Chindwin Division in 1902 and the flowering has been gradually advancing southwards and eastwards. In 1905-06 it had reached the northern reserves of the Myittha and Katha Divisions and is reported as now occurring in some of the reserves in the Mu Division."
1907-08	...	Northern Circle ...	"A wave of the flowering of *tinwa* which has been advancing over Upper Burma during the past 4 or 5 years."
1908-09	...	Henzada ...	Gregarious flowering.
1910-11	...	Shwegyin ...	Sporadic flowering of young *tin* 3 or 4 years old ; seed infertile.
1910-11	...	Northern Circle ...	General flowering of bamboos in the Upper Chindwin ; species not stated.

The above extracts certainly justify the placing of the *tin* bamboo in Brandis' second class.

10. The following extract is taken from page 662 of "Indian Trees" :—

> "When, after the flowering of bamboos in a certain district the fires of the hot season have swept away the tangled mass of dry stems, the next rainy season produces millions of seedling bamboos, which soon grow up into slender plants 2-3 feet high, forming dense waving green masses on the ground. Among these millions of plants the stronger gradually get the upper hand, and these in course of time develop into those remarkable rhizomes, consisting in tufted species of innumerable stout twisting and interlaced branches, which produce the leaf-bearing culms. The

development of bamboo seedlings into a clump is a most remarkable process, which has not yet been sufficiently studied—(of. Brandis, in *Indian Forester*, XXV. 4). Nor has it yet been ascertained how many years a seedling requires to form a clump consisting of full-sized stems. In the case of *Bambusa polymorpha* and *arundinacea* the period is probably between 8 and 12 years. Offsets from mature clumps produce full-sized culms in 2 or 3 years.

In the case of *tin*, I can add my quota to the above by saying that under the most favourable conditions it takes from 12 to 15 years to produce full-sized stems and that under unfavourable conditions the time required may be anything up to 30 years or more—(see para. 20).

11. The foregoing remarks are sufficient to convince anyone that *tin* plays a very important part in the teak forests of Burma. I wish now to go into details as to the conditions under which it exists in one division—Pyinmana.

There are no less than 9 working-plans. A start was made in 1896 at the southern end, with the Yeni Reserve. Working gradually northwards, through the Minbyin, Yonbin, Palwe, Kaing, Yanaung Myin, Ngalaik, Pozaungdaung and Taungnyo forests, plans for the reserves on the Pegu Yomas ended with the Sinthe one in 1902. In 1903 a plan for two small patches of forests (Mehaw and Ziyaing) in the hills east of the railway was drawn up.

In the working-plans are the following references to the flowering of *tin* bamboo :—

Yeni, 1897.—"*Tin wathon* occurs everywhere where the cover of the older bamboos is sufficiently open to allow of its growth."

It is mentioned in the descriptions of five compartments.

Minbyin, 1892.—"There is often a dense growth of *tin wathon* which interferes considerably with reproduction and which, together with the heavy shade of *kyathaung* is the cause of the smaller classes of teak being less well represented in the moist forest than in other and drier portions."

Wathon is mentioned in the descriptions of 38 compartments out of 126.

Yonbin	... 1899	... No references.
Palwe	... 1899	... Recent flowering mentioned in 8 compartments, *wathon* referred to in 2 others.
Ngalaik	... 1900	... Recent flowering mentioned in 3 compartments.
Taungnyo	... 1901	... One year old *wathon* in 2 compartments.
Pozaungdaung	1901	... Recent gregarious flowering in 6 compartments.
Sinthe	... 1902	... (Dry forests, no *tin* bamboo).
Mehaw	... 1903	... No references.

The dates given above denote the years in which the field work was started. In most cases it was completed or nearly so in one season. 1897 means 1896-97.

As Toungoo is next door to Pyinmana, and only separated from it by an artificial line, the old frontier line, it is worth while mentioning here that the occurrence of *tin wathon* is mentioned in all the plans for forests west of the railway (Pegu Yomas). These plans were completed between 1892 and 1901.

12. A certain amount of caution should be exercised in using these extracts. The absence of any reference to *wathon* in a compartment must not be taken to mean that *wathon* did not exist there when the plan was written. In some cases it may not have existed or may not have been noticed; in others the omission of this detail from the stock descriptions escaped notice. If you do not set out with the idea of specially noting on any particular point, it often passes unnoted altogether. For example:—Two years ago I spent some days in looking at girdling in Minbyin, without being at all struck with *tin wathon*; this year it dwarfs everything else.

There is also a good deal of ambiguity about the use of the terms "reproduction" and "regeneration." The terms ought to be restricted to seedlings and small saplings; but I have come across instances where, on questioning the writers, I found they had poles in mind more than anything. Again, as to the use of the terms "good", "fair," "bad," etc., it is easy to convey wrong impressions by using definite terms in describing general observations. It takes time to take in everything. In an uneven

aged and mixed forest it is not easy to decide what class of any species is deficient or absent. As nobody knows the rate of mortality it is not easy to say whether any class is sufficiently well represented to keep up to the level of the next above it.

13. Protection from fire began in Pyinmana as follows :—

1892	... Yanaungmyin.	1900	... Minbyin.
1894	... Kaing.	1902	... Yonbin.
1897	... Yeni.	1904	Taungnyo and Ngalaik.
1899	... Palwe.		

In 1907, half Kaing was thrown out, and in 1912 the balance (except young plantations).

The expenditure on protection in the 10 years ending with 1910-11 amounted to Rs. 1,30,161, or about Rs. 13,000 a year.

14. Two inhabitants of Chaungwa, a village in the middle of the Minbyin Reserve, recently told me that they distinctly remembered the flowering of the *tin*, and that it took place all over the southern part of the reserve two years before the Annexation, that is, in 1882. They said the flowering was general. In reply, however, to further questions they said it might have taken place later in the northern half, but that all was over within about 10 years.

NOTE.—The two old men I talked to said their ages were 56 and 60, and they both said they remembered a general flowering of *kyathaung* in B. E. 1231, *i.e.*, 1870 or 42 years ago.

If their statements are to be believed the *tin wathon* in South Minbyin is now 30 years old, and it was 15 years old when Mr. S. Carr wrote the working-plan.

In several compartments Mr. Carr referred to the *wathon* as being very tall and dense. Bearing in mind the fact that protection from fire had not then been started, and from what I have seen of young *tin* of known age elsewhere, I am certainly of opinion that the young *tin* in Minbyin does date about from 25 to 30 years.

15. The absence of all references to *wathon* in the Yonbin Working Plan (1899) is remarkable. It is mentioned in Palwe (1899). Yonbin comes between this forest and Minbyin. When girdling was done in Yonbin in 1900 dense *wathon* of several years' growth was very much in evidence. Villagers have told me

that they distinctly remember the flowering about 15 years ago, when Mr. Muriel was D. F. O. This would be about 1897, or just before the working-plan was made. The Manager, Messrs. B. B. T. Corporation, puts the date 3 years later. He has recently told me that he was in Yonbin in 1900 and distinctly remembered telling the D. F. O., Mr. H. Carter, of general flowering that year. I infer therefore that here as elsewhere the flowering was spread over a number of years.

16. The course of the *tin* flowering appears to have been somewhat as follows :—30 years ago it was general in Toungoo, and also in the adjacent parts of Pyinmana (Yeni, Minbyin). In the next ten years it made very little progress. 15 years ago it reached Yonbin, and, within the next 5 years, it spread all over the rest of the *tin* bearing areas west of the railway, the business being completed last of all in the Yanaungmyin, Pozaung-daung and Kaing blocks in 1908. East of the railway *wathon* is now very conspicuous in Mehaw and is also said to date from the same year. Flowering in the adjoining forests of Gwethe, is mentioned in the Toungoo Annual Report for 1906-07.

It must not, however, be supposed that the flowering was limited to the years named.

Flowering of any species of bamboo should be looked upon as dividing itself into three stages : 1st sporadic flowering of odd clumps in advance, increasing in volume until the 2nd stage of gregarious flowering is reached, and then tailing off to sporadic flowering of odd belated clumps as the 3rd and last stage. There are great variations in the lengths of and relative proportions between these stages. With *tin* the shortest times are a year apiece, or 3 years for the whole business. On the other hand in some places I have no doubt the 1st and 3rd stages are so very much more prolonged that the 2nd may be neglected or escape notice altogether.

17. Go where you will in the unprotected *wathon* forests in Pyinmana, one feature is noticeable—the bamboo has a hard struggle for supremacy. The longer the interval since the flowering the greater the variations. Locality and season have a lot to say in

the matter. Fires vary in intensity from place to place, and from year to year in the same place. In a wet year such as 1910, in lots of places there is no burning at all. The younger the bamboo growth, the more it benefits from such favourable conditions. In Mehaw the 4-year old *wathon* is now locally a dense mass 6 to 8 feet high in which a man cannot be seen ten yards off. In other places it is an open low growth in which a man would have to lie down to hide himself. It is a remarkable fact and yet true that the age of *wathon* in unprotected forest cannot be judged by its size. It may be anything from 2 to 20 years or more. The opposite sides of any of the external fire-lines in Pyinmana can furnish examples of this. On the outside the *wathon* is often so low and open that its very existence as *wathon* passes unnoticed. On the inside right up to the very edge of the fire line is a dense mass of *wathon* 20 to 30 feet high in which an elephant would be lost at ten paces distance.

18. The differences between the *wathon* with and without protection are no more striking than the differences between the teak regeneration in them. In the open type of suppressed *wathon* all stages can be found from the small seedling to the stout sapling ; patchy and deficient in many places it is true, but at any rate giving rise to a reasonable hope that the teak will hold its own. And on the other side, what is the state of affairs? *Most of the teak regeneration that existed at the time the protection from fire was started has been absolutely wiped out and no more has been able to establish itself.* The Minbyin Reserve can give plenty of examples. Let me refer to the 1st and 2nd sub-periodic blocks—51 compartments.

The Working-plan Officer in 1897 described teak reproduction in them as—excellent, 15 ; very good, 7 ; good, 18 ; fair, 9; poor, 2. 38 of these compartments have been under protection for 10 to 15 years, and in them it is now only the places without any bamboos at all, or with big *kyathaung*, which save them from being booked as practically devoid of any teak regeneration at all. Alongside dragging paths and other openings you may find a little, but nowhere else. Cs. 27, 28 and 35 in which I spent two

days are enough to sicken anybody. They are hard to beat I am sure. This is what Mr. S. Carr wrote about them in 1897 :—

> C. 27.—".....*tin wathon* is common and in places very dense. On the ridges and slopes teak is very plentiful and large trees are numerous.....Reproduction is good on the whole, but seedlings are irregularly distributed. The dense bamboo cover (both young and old) in many places prevents their development."
>
> C. 28—Like C. 27.
>
> C. 35.—"..... *tin wathon* is almost universally distributed and is often very dense.....Reproduction is good."

When girdling was done in Cs. 27 and 28 in 1903 the Girdling Officer remarked on the absence of the seedling class.

What do these compartments look like now in 1912? First class bamboo plantations! Potential paper-pulp! I went to look especially for teak seedlings and saplings. I walked for two hours along the main ridge in C. 27 without seeing a single one. I made no enumerations, but estimate that I saw far more trees over 5 feet than under. I was constantly pulling up before the mournful spectacle of big trees left by the Girdling Officer in 1903 for seed. What a wretched waste! How many tons of seed have been shed by them in vain!

Two enumerations have been made this year: 240 acres in C. 35 (dense *wathon* except on the tops of spurs and in ravines); 300 acres in C. 95 (not protected; big *kyathaung* with a little suppressed *wathon*). The results per 100 acres are—

			C. 35.	C. 95.
Under 6″ girth.	Under 4′ 6″ height.	New ...	...	4
		Old ...	23	290
	Over 4′ 6″ height		40	76
6″ to 8″ girth			10	18
9″ to 11″ girth			10	28

"New" seedlings are those with no old root stock visible.

The 23 "old" seedlings in C. 35 are the last survivals of what Mr. Carr called good reproduction 13 years ago. All these and the 40 over 4′ 6″ high are outside the *wathon*. There are absolutely none inside.

19. Examples such as the above could be multiplied indefinitely in all the reserves in which fire-protection has been the order of the day. They prove conclusively that the teak is nothing like so well off now as it was 10 to 15 years ago. The luxuriant growth of the young bamboos owing to the protection from fire is the only assignable cause for the change.

NOTE.—If additional weight to the argument is wanted before putting a period to protection, the best plan would be to ask the officers who wrote the working-plans to come and revisit them for a week or two. It would be miles cheaper in the end.

20. A subject which has not yet been discussed is the time required for seedling bamboos to become full-sized. My observations go to show that the period for *tin* is longer than commonly supposed—(*vide* para. 10).

The following are examples of *tin wathon* which has grown up more or less under protection :—

(*a*) *Yanaungmyin.*—Flowering took place in 1908. No fires since then. In the most advanced places the average height of the main mass of the *wathon* is now (1912) only about 5 feet and the biggest stems are not more than about 2″ in girth at breast height. No fires have occurred in the interval.

(*b*) *Kaing.*—Protected since 1893-94 and flowering about 1898 to 1900. Three-quarters of the reserve is now covered with a dense growth of *wathon* from 15 to 30 feet high and up to 5″ in girth. Stems of more than six inches are very rare. Thinning out of the stems has made considerable progress in the past 12 to 14 years, but the stems have not yet made much progress towards sorting themselves into well-defined clumps. It is a slow business walking about without clearing away with a *dah*.

(*c*) *Yonbin.*—Protected since 1902 flowering about 1897.

The *wathon* is very much the same as in Minbyin described below. The largest stems run to 70′ by 10″.

(*d*) *Minbyin.*—Protection began in 1900; flowering took place about 1882 (para. 14).

The thinning out into distinct clumps is complete in places, although the clumps are still far more numerous than in old *tin*, and the clumps still retain their characteristic appearance of *wathon*. The average height is well over 30 feet, and the biggest stems are 50 to 70 feet by 8″ to 9″ girth. *It is only the recently formed stems that are this size.* In all clumps, the stems are of all sizes down to small sticks. In clumps of undoubtedly old *tin*, which are to be met with here and there, I have not been able to find any stem of more than 70 feet by 9″.

From the Yonbin *wathon* it may be inferred that it takes from 12 to 15 years for the development of full-sized stems under the most favourable conditions. The Minbyin *wathon* shows that under unfavourable conditions the period can be extended very considerably.

The variations caused by the 15 years' interval without protection in Minbyin are very great. In some parts of C. 35 the biggest stems do not exceed 32 feet by 4″. Elsewhere they run to 6″. In C. 103 unprotected stems of 60 feet by 9″ are to be met with.

21. A thorough grasp of the fact that it takes bamboos so many years to come to maturity, under the most favourable conditions for their rapid development, leads to a whole train of reflections. The great length of the periods between flowering (40 to 50 years) no longer seems so extraordinary. It also remains to be seen whether the periods will not be appreciably shortened by protection. The flowering is certainly likely to be far more gregarious than under natural conditions. These are forces to be reckoned with in any proposals for regulating fires in the future. It would be worth while sacrificing a lot of

regeneration (by protection), or a lot of standing or fallen timber (by burning), if the principal bamboos could be induced to flower block by block as we wanted them to. The *kyathaung* bogey is not dead. It may yet be a veritable nightmare to many of us.

III.—Suggestions.

22. It is to be hoped that a full account of the experiments carried out in the Northern Circle during the past five years will soon be published. The remarks in annual reports are not enough to enable an outsider to follow the course of the experiments closely.

In his Annual Review for 1907-08 Mr. Lace remarked that the burning over of flowered *tin* or *myin* areas in Katha had shown that sufficient teak can be established over extensive areas at a comparatively small cost; and that artificial sowing is not as a rule necessary. All that need be done is to burn the areas for one or more years according to the time taken to burn the dead culms thoroughly, and, after the last burning, to cut back all injured or badly grown teak saplings and small poles, such operations being followed by such periodic cleanings and improvement fellings as experience shows to be necessary.

These remarks are definite enough. It is not easy to understand why they have not been circularised as a working basis in all circles and in all divisions where *tin* and *myin* prevail. Rs. 40,000 in the interval spent on protection in Pyinmana alone—mostly wasted.

23. Never having seen gregarious flowering of any bamboo myself there is a lot for me to learn of the practical details. Most junior officers are in much the same position.

(*i*) Is there any means of telling beforehand when to expect a general flowering other than the advance flowering of odd clumps referred to in para. 16?

(*ii*) How long does it take for the dead stems to dry up and fall over with or without the help of fire?

(*iii*) What happens to the root-stocks, and how long do they take to disappear with or without the help of fire?

(*iv*) What burning is necessary to get rid of the dead stems ?

24. It may be unintentional but later annual reports rather give the impression that fires are still to be kept very much at arm's length. "Abandonment is only sanctioned as a temporary measure for 3 years" dosen't sound very hopeful. If two and two do make four "protection" ought by this time to be looked upon as the temporary measure.

A loud note of warning is necessary. *In flowered bamboo areas there is no turning back once you have started protection.* This may seem to many a ridiculous exaggeration ; but it is nothing of the sort. After a few years' protection the bamboos scoff at fires and decline to bow to anything but the *dah*. The Kaing Reserve (para. 20) is an excellent (or rather deplorable) example. Fires alone will make no appreciable impression on the dense mass of bamboos 15 to 30 feet high. Short of waiting until the next flowering for further teak regeneration, there is nothing for it but to cut down the bamboos wholesale. In 19 years a sum of Rs. 19,272 has been spent on protection in Kaing. To put the clock back and leave the forest *as it was before protection began* would cost at least Rs. 10,000 more. The case must be exactly similar in all *wathon* areas. Without exception therefore the rule should be :—

In flowered bamboo forests protection should be strictly limited to such areas as can be adequately attended to afterwards.

It is admitted on all hands that the state of a forest after protection, without sylvicultural operations, is worse than before. If you can only manage 10 square miles of cleanings and improvement fellings a year it is worse than useless to protect more. Let the rest wait till you are ready. Give fire half a chance and it will make the *wathon* mark time. After all, it must not be forgotten that our interference at all with the ordinary course of things is solely with a view to increasing the proportion of teak. There is no getting away from the fact that the teak can hold its own if the forest is left alone.

25. The results of actual experiments in the Northern Circle, when published, ought to settle once for all what is the best way

of treating recently flowered areas. It may be taken as fairly certain (para. 22) that the cost of the sylvicultural operations to start regeneration in them on a satisfactory basis need not as a rule be great. The very big question however still remains to be answered : what about older *wathon* areas where, owing to protection or other causes, the bamboos have got the upper hand ?

Here it is a case of teak regeneration being literally choked off and, if the hiatus is not to extend up to the next flowering, the bamboos must be got rid of, and this will not be an inexpensive business.

It cannot be too strongly emphasised that improvement fellings, in the ordinary sense of the term, are absolutely useless. Kept in their place for the helping on of saplings and poles, they are right enough. To speak of them in connection with regeneration is hopeless and misleading, unless they connote the wholesale cutting back of bamboos. In practice this is exactly what they do not mean, for they leave bamboos severely alone.

I have recently inspected some improvement fellings which cost about Rs. 2 an acre. They are quite good in their way and will help on saplings and poles very considerably. Additional regeneration was not aimed at, and so they leave absolutely untouched all the places where the big bamboos predominate, amounting to far more than half the total area of the compartment. This example is typical of nearly all improvement fellings in Burma. Bamboos predominate in the vast majority of the forests. It must be confessed therefore that our much talked of Improvement fellings do not and never will count for much in respect to regeneration. They look well on paper, and that is about all there is to be said for them.

26. Fire alone will not get rid of bamboos. They must be cut first. There are two ways of doing this—departmentally or through the agency of the taungya cutter. The choice depends to some extent on the object aimed at. If the uneven-aged character of natural teak forests is to be preserved, then the areas operated upon must be very small, and taungya cutters

could not be induced to work them. If plots of an acre or more are not objected to, then there is no reason why any departmental cutting on a large scale need be resorted to.

I am a great believer in taungya plantations. They are out and out the cheapest way of creating a teak forest of any desired density in heavy bamboo growth. As the choice of locality and density of the final crop are quite under the control of the Forest Officer (provided that he sticks to areas suitable for teak), it seems to me that a forester could desire nothing better. He can have any kinds he likes; large plantations or small ones; pure teak or a mixture. He can please himself how much of the natural forest he leaves untouched. All that is essential to success is that he has some method about extensions and subsequent cultural operations.

An objection to plantations is the cost of creation and subsequent treatment. They may be expensive, but men who make the objection are apt to forget that the final yield from a plantation will be anything up to a hundred times as much as from ordinary teak forest. You cannot get anything worth having this world for nothing.

In respect to plantations we are as conservative as we are with fire-protection. Line sowing at Rs. 10 an acre is still the rule. Minbu is the only division I have heard of (other than the *wathon* sowings in the Northern Circle) in which broadcast sowing is done. I have tried it myself in Pyinmana with great success. In the 1910 plantations I did half in lines at Rs. 10 and half broadcast at about Rs. 2 an acre. In January last I found one quite as good as the other. If anything the best patches in the broadcast were a little better (13 feet high) than in the line sown portion. On steep slopes seed gets washed away and dibbling in lines is better; on gentle slopes and flat ground the broadcast is superior. More seed is wanted for the broadcast method, but as seed is not a big item this does not matter much.

This article is not concerned with the *pros* and *cons* of taungya plantations from a financial point of view. My sole reason for mentioning them is because they are one way of retracing our

steps, covering up the traces of our past mistakes, defeating the ubiquitous bamboo and enriching the forest with teak. If the remarks made in the next paragraph are borne in mind, I think it will be admitted that plantations could be run on a scale commensurate with our need for them.

27. Notwithstanding the magnitude and variety of the proposals that have been put forward from time to time for the improvement of the forests in Burma, I have never come across any reference to the question as to whether we want to improve *all the forests*. It has been taken for granted that measures for protection and improvement should be co-extensive with the reserves themselves. Is this a sound policy? If we could multiply the supply of teak twenty-fold or fifty-fold or a hundred-fold would the market absorb it all? I rather doubt it. Anyway the attempt to deal with such vast areas has crippled our energies very considerably. Nothing is voted as of any practical value unless it can be thought about in hundreds of square miles. We are in consequence reduced to doing next to nothing. I forget whether the subject was raised at the Maymyo Conference (1910). Anyway it does not appear in Mr. Troup's amended memorandum, under which all forests in a given locality are included in one working circle.

It seems to me that it would be far better to set out with the idea that, the more we can increase the productiveness of a portion of the total area, the smaller that portion may be. If the productiveness of one-fifth be increased ten-fold, we would double the present yield whilst leaving four-fifths to look after itself. This would certainly be a good working basis for a single generation. Following up this idea I would abolish all our piecemeal working-plans, and I would bring into one working circle all the localities which are best suited for the growth of teak up to one-fifth of the divisional total. Outside I would have selection fellings and, if you like, such simple operations as creeper cutting, *nyaungbat* felling, etc., but no fire-protection except of girdled trees and fellings. Inside I would lay myself out to get the ten-fold yield. If I did not succeed my successors

could take in more from outside. They would be no worse off than we are now. What a difference this plan would make in our outlook ! The dread *kyathaung* would be robbed of much of its terrors, if we knew that we need not worry about it in four blocks out of five !

28. The foregoing remarks will, it is hoped, have brought out the necessity for taking the flowering of bamboos as the pivot on which to hinge all schemes for improvement of the forests, with teak regeneration as the main objective.

There is only one step further to which I wish to carry the argument. If our sylvicultural operations ought to hang on the flowering of bamboos, why should not our method of exploitation do so likewise ? It ought to do so.

At present we have an endless series of arbitrarily chosen felling rotations varying from 20 to 40 years. How much more scientific it would be to set out with the idea of regulating all our operations by the flowering cycles of the bamboos which exert such a predominating influence in the forests.

Proposals for introducing the uniform system into Burma have come into being within the past few years. The flowering of bamboos puts practical limits to the conversion from the selection system. Instead of aiming at regeneration once in 150 years in a given locality, we should recognise the fact that nature provides us with excellent regeneration at special times once every 30 to 50 years. If we aim at making the most use of this we will end with a sort of three storied forest. We will not however want to do all the regeneration in a year or two over a whole working circle with none in the intervals. But we can with the help of fire hold back the *wathon* to suit our own convenience and thus enable us to deal with individual compartments one after the other, and to spread the regeneration of a whole block over the flowering cycle of, say, 50 years. There is some conflict between the view here expressed and that advocated in para. 26. Three-storied taungya plantations won't work. A plantation means regeneration which does not require to be supplemented or renewed for, say, 100 to 150 years. There is no room for extra

teak in the next bamboo flowering cycle. This is true enough, and yet there need be no overlapping. I would limit taungya plantations to areas where bamboos are big or where *wathon* is out of hand. Wherever there is a reasonable hope of success in young *wathon* areas I would trust to fires and natural regeneration (para. 22).

29. At the Maymyo Conference in 1910 the idea was put forward and accepted that any desired degree of teak regeneration could be obtained by intense improvement fellings several times repeated. Nothing was said about the flowering of bamboos and the impression conveyed was that you might start the operations when and where you pleased. If the arguments advanced in this paper are sound this is very far from being the case. The natural time for beginning cultural operations aiming at regeneration is with the flowering of the bamboos. Operations at any other time may be looked upon either as trying to make up for lost time or as trying to forestall nature, according as the last flowering is nearer or further off than the next one to be expected in the future. In either case the expense is bound to be greater than if there is co-ordination with nature.

30. It is impossible to travel far in the unprotected forests in Pyinmana without being struck with the fact that there is a great disproportion between the numbers of small seedlings and saplings of teak. This is well shown in linear surveys in which stems under 6 inches in girth are divided into two classes according as less or more than 4'6" high (para. 18). It is well known that seedlings get burnt back year after year. Eventually some get above the danger zone and shoot ahead.

Two years ago I suggested to the Conservator, Mr. E. S. Carr, that protection for short periods could not but help to improve matters. The proposal I then made was shelved. I still think that there is something in the idea. Inasmuch however as *wathon* is so widely distributed, the chances are that we would do as much harm to regeneration in one place (by favouring the bamboo) as we would do good to timber in another, unless prepared to step in with cultural operations. In the four-fifths of the division which

would come outside the working circle of intense operations (para. 27), I would therefore limit protection to girdling or felling areas discussed in the next paragraph.

31. So far I have only touched on the use of fire as an aid to teak regeneration. What about the damage to standing trees and timber? This cannot be denied and ought not to be belittled. It ought to be reduced as much as possible. Each forest should be dealt with on its own merits, a start could be made anywhere for standing timber needs protection everywhere. Selection is however possible, and, for a start I would make it a rule to first of all protect girdled trees until fellings were completed. This would rarely be for more than five years, and three would generally be sufficient. Another useful expedient would be to prohibit felling and logging after 15th February. This is done in protected areas but not outside.

As regeneration is all that has hitherto been thought about in respect to the selection of areas for protection, to base the latter on girdling or felling areas would mean a total re-arrangement of the protective measures. In Pyinmana it would mean the giving up of protection in about 270 square miles and the starting of it in another 100 square miles. It would reduce the total area under protection (and the bill) to half. But not more, and so, before committing ourselves to even this much at present, the opening remarks in this paper about the financial position of the province ought to be considered.

Protection from fire of standing timber is only one of many possible measures of improvement. It has no right to claim precedence over climber cutting, *nyaungbat* felling, roads and buildings, wells, etc., and the various other ways in which the forests and their exploitation can be improved. We ought to get rid of the idea that everything must play second fiddle to protection. Given unlimited funds it does not matter. With a budget cut down almost to a vanishing point it is a matter of considerable importance. For example, to protect all girdling areas in Pyinmana Rs. 6,000 a year will be required. For the next few years, at any rate, I venture to think that Rs. 4,000 of

this could be more usefully spent on buildings and wells, to say nothing of roads and creepers. As soon as the lean years are over protection can be extended.

32. It may be urged that the conclusions arrived at in this essay are of very little practical value, seeing that they only take account of one set of conditions, whereas the forests of Burma present the bewildering spectacle of an almost endless variety of different conditions. It is quite true that *tin* is only one bamboo amongst many; that it does not even exist at all in many forests; and that there are other things to be thought of besides regeneration. Still, I believe that considerable progress towards understanding how to deal with all bamboos can be made by getting a thorough grasp of the way to tackle one of them. I would go a step further. I believe that the same method of treatment is likely to suit all. I do not think that the distinction between the moist and dry types is so great as is generally supposed in respect to teak regeneration.

We lose very considerably by our habit of thinking of only one thing at a time. Teak girdling, pyingado fellings, unreserved fellings, and cultural operations are all more or less run independently. If they do happen to hit it off together in one place, it is more by accident than by design. It is about time that a move was made towards something a little less primitive. Heaps of examples can be found in divisions like Pyinmana. Here is one. The improvement fellings referred to in para. 25 are in Yanaungmyin C. 6. This compartment contains big *kyathaung*, young *tin wathon*, dead *wannwe* which flowered last year, and *thaik* bamboo (*B. tulda*) now in flower. Heavy pyingado fellings took place some years ago. It contains a good deal of big teak mostly unsound. In the working-plan everything was subordinated to planning for a steady outturn of sound teak in the near future, and so the compartments with the largest percentage of unsound timber in them are to be left until last, whereas a sylviculturist would have put them first. At the moment, however, I am not so much concerned with this. I only want to try and show how much more could be done in the way of cultural operations by a

little more looking ahead. The improvement fellings leave more than half the compartment untouched. They don't affect the bamboos. This is the very part I should have liked to have seen tackled this year. There is room for natural regeneration with the help of fire in the suppressed *wathon* and flowering areas and for artificial regeneration by means of *taungyas*, in the big bamboo and dense *wathon* areas. Taken in hand simultaneously the whole lot could be managed and none need be overlooked. Left for the future they become an impossibility. The nett result therefore is that instead of multiplying the productiveness *of the whole area* by ten we are satisfied with a possible doubling of it in half the area.

It may also be urged that the conclusions arrived at in this essay are too sweeping and misleading; that *tin* is not the only bamboo in Burma and in many places there are no bamboos at all, and so the beautiful simplicity of my rotations based on flowering cycles is very much visionary. It is true I have only carried on the argument for one species of bamboo, but I believe it can be applied to all. The indiscriminate protection of all types of teak forest hitherto in vogue has produced such a crop of negative results, and the enormous size of our forests has seemed to do nothing but raise a laugh at our expense for the smallness of the impression made on them by half a century of Forest Officers. Am I deluding myself with a vain hope in thinking that the bamboos themselves hold the key, and that we may yet see daylight within the next few years?

PYINMANA: F. A. LEETE,
26th April 1912. I.F.S.

A PLEA FOR ECONOMIC FORESTRY.

Mr. Jerram's letter in the June *Indian Forester* on my article on the above subject affords me an opportunity of explaining more fully one direction in which I feel convinced Indian forestry is in need of early investigation.

Mr. Jerram is correct when he understands me to be an advocate of a financial rotation. I say purposely "a" financial

rotation, as I fully appreciate we are not yet in a position to calculate the financial rotation for Indian forests with the minuteness it is done on the continent of Europe. Mr. Jerram objects to a financial rotation for two reasons :—

(*a*) that trees must be large enough to yield, say, sleepers with a minimum of waste, and

(*b*) that trees must not be so large as to be liable to excessive damage in felling.

Under (*a*) I gather he means by "minimum of waste" a reasonable proportion of waste. If that is so I agree with these requirements. Indeed in my original article I stated that the rotation must be such as will yield the most useful produce. Again these requirements are provided for in my proposals to base the calculations on the value of the actual outturn. For, if sleepers are the most profitable form of timber, the value of the outturn will rise considerably at that rotation at which trees will yield sleepers, and again proportionately as the wastage decreases whether it be in felling or sawing..

The trouble is, as Mr. Jerram suggests, that the limits imposed by a consideration of wastage alone are very wide indeed.

Mr. Jerram then proposes that the rotation within these limits should be fixed to correspond with the culmination of the mean annual (timber) volume increment of a tree. He says if necessary account should be taken of value increment too, and later he expresses some doubt as to the value of deodar sapwood. Although in this latter matter I would go even further than Mr. Jerram and definitely say that deodar sapwood should be treated as valueless, yet otherwise I do not think the Indian timber market discriminates as to quality of deodar timber relative to age.

Mr. Jerram claims that the method he proposes obviates the necessity of fixing a minimum rate of interest to be required of the forest. This it certainly does, but at the same time the culmination of the mean annual increment is not sufficiently definite to determine the best rotation with any accuracy. A reference to European Yield tables will show the mean annual increment *for a crop of* 1 *acre* lies as a rule within 5 c.ft. for 50 years or so.

Apart from this, the culmination of the mean annual increment of individual trees does not coincide with that of crops, but will be much later. For the number of trees per acre must diminish with increasing age and this means that while the mean annual increment of a crop is rising a small number of trees is able to put on a larger increment than the previously greater number of trees. Much more so then must the diminishing number of trees be increasing their own previous mean annual increment.

The following figures from a Scotch Pine Yield table of the II quality will illustrate this :—

Age.	Number of trees on 1 acre.	Volume of timber on 1 acre.	* Mean annual increment of crop, final yield only.	* Mean annual increment of average tree.	Remarks.
		c. ft.	c. ft.	c. ft.	
50	760	2,820	56	·08	* Disregarding intermediate yield in previous years.
70	440	3,970	57	·13	
90	300	4,740	53	·18	
110	220	5,340	49	·22	
130	180	5,800	45	·25	

From the above it will be seen that Mr. Jerram's method would lead to a rotation of 130 years or even more, for I have taken no account of increase in value. And there is every probability the value would be rising beyond 130 years if for no other reason than that the proportion of wastage in conversion would be falling. Correctly calculated, in this case the rotation of the highest mean annual timber increment of the crop and the financial rotation fall at about the 80th year.

Mr. Jerram's objections to my suggestion are that not only like his method must it be based on single trees, but that it involves the fixing of a rate of interest.

I admit that it is not altogether satisfactory to have to base the calculations on statistics for single trees, but I do not think want of better data warrants neglect of all proper consideration of the financial results obtained. It is true that as shown above Mr. Jerram's calculations based on single trees are useless, but

the same argument does not apply to the method I suggested. I will illustrate this by the following figures for a deodar tree :—

Age.	Volume of timber.	Mean annual increment.	Value of unit of timber.	Value of tree.	Rate of compound interest yielded by tree.
	c. ft	c. ft	Rs. a.	Rs.	
100	50	·50	0 8	25	2·4%
120	80	·66	0 8	40	1·1%
150	110	·73	0 8	55	

Mr. Jerram would accordingly fix the rotation at 150 years or more, but the rate of interest the tree is developing shows that the rotation cannot be prolonged beyond 120 years without considerable sacrifice.

Applying the same calculation to the figures given in a European Spruce Yield table, 2nd quality, the following results are obtained :—

Age.	Final yield.	Intermediate yield if rotation prolonged.	Crop retained if rotation prolonged.	Rate of compound interest developed.
	Rs. per acre.	Rs. per acre.	Rs. per acre.	Per cent.
30	262	23	239	9·8
40	611	69	542	7·5
50	1,115	121	994	5·8
60	1,749	198	1,551	4·3
70	2,359	286	2,073	3·6
80	2,942	355	2,587	2·7
90	3,372	411	2,961	2·2
100	3,668	449	3,219	1·8
110	3,844	459	3,385	1·4
120	3,889	431	3,458	

[NOTE. Here the rate of interest is calculated on the yield per acre but after the intermediate yield has been removed, so that it may fairly be taken to apply to the average individual tree.]

It is seen from the above that, given a minimum technical rotation of 70—80 years, in prolonging the rotation beyond 80 years an even greater sacrifice is made than in prolonging it from 70 to 80 years. And beyond 90 years the rate of interest (2·2 per cent) can in the circumstances scarcely be considered adequate. I have left intermediate yield out of consideration in my calculation. This will generally be necessary in India as satisfactory figures for the comparison of the yield of crops are seldom available: and since revenue from intermediate yield can always be invested in enterprises other than forestry to give equally good returns the omission is of little consequence.

As regards Mr. Jerram's second objection it will be seen that I do not propose to fix any minimum rate of interest which must always be required. I propose to investigate the rate of compound interest at which trees are progressing and to let the results determine an economic rotation suitable to the particular circumstances.

I am sorry Mr. Jerram does not quote the many objections he finds to my proposal, so that I might deal with them. As to his statement that I would reduce the rotation below that of the greatest yield, I can only point out again that he has given no practical means of determining the rotation of the maximum mean annual increment of crops with sufficient accuracy. Again he disregards the all-important factor in forestry—"time"; for instance, given a certain area of forest the lower the rotation the larger the area annually attaining maturity.

The difficulty of persuading present and future Governments of the financial aspects of forestry should not be so great as Mr. Jerram anticipates. And certainly the peculiar views of laymen cannot justify forest experts failing to try and persuade Government of the soundness of economic forestry.

The case to be put to Government is not quite as Mr. Jerram represents it, namely, enhanced revenue now and lower revenue hereafter. It is rather, under present methods, the current revenue for as many years as it is decided to spread the mature stock over, and then probably a great falling off owing to the unavoidable neglect of sylviculture. Or, the alternative, supposing

rotations generally have to be reduced, of enhanced revenue now owing to reduction of stock and thereafter more than the revenue under the present system of working.

Since some years it has been the policy both in France and Germany to reduce, if not remove, the surplus growing stock; and in a number of cases such revenue is now being placed to a reserve fund to meet extraordinary forest expenditure and equalise forest revenue. If the formation of such funds were not possible in India we still need not stop trying to convince Government of the wisdom of working the forests more economically.

For example, there should be little difficulty in persuading Government of the advantage of working the more valuable forests to give the greatest sustained profit, provided, say, the present fixed maximum annual outturn were not exceeded, and allowing surplus stock to remain in the less accessible or valuable areas.

Mr. Jerram's argument that nature having provided the capital is best able to determine the most suitable rate of interest betrays some want of confidence in scientific forestry. I am in agreement with him when he expresses this in reference to much that has been achieved in India in the past, but he overlooks what has been the real cause of these results, namely, regulated consumption instead of scientific sylviculture.

Mr. Jerram also argues that forestry tends to produce a larger number of trees on an area and so slower growth of individual trees. This argument presupposes that little, or no, advance can, or will, be made in the matter of thinning crops to such an extent as to grow the largest quantity of the most valuable produce in the shortest time. Again I am in agreement with Mr. Jerram if the present system of regulated consumption is to continue to be practised over the largest area possible with the staff available. But does not Mr. Jerram look forward to a time when with a larger trained staff more intense working may be possible? And cannot a claim to an increase of the trained staff best be made by demonstration of what scientific forestry on an economic basis can achieve?

A. D. BLASCHECK,
I. F. S.

RESOLUTIONS OF THE BOARD OF CONTROL, IMPERIAL FOREST COLLEGE, DEHRA DUN, 1912.

We print below resolutions II, III and IV. No. II has been accepted by the Government of India, No. III is, we understand, still under consideration, while No. IV has been circulated to Local Governments for expression of opinion.

Resolution II.

The inauguration, with effect from the 1st November next, of a separate two years' course of training for candidates for direct appointment to the Provincial Forest Service, in place of the present third year course, having been sanctioned, the President of the Research Institute and College put before the Board a suggestion that there should be no third year course in 1912-13, but that, as an exceptional measure, Local Governments be given the option of appointing as probationary Extra Assistant Conservators, without further training, candidates who would otherwise have been sent to that course in July next.

As regards the first part of the proposal, it would be very inconvenient to give the third year course in 1912-13, and also to inaugurate the new separate course on the 1st November 1912. The Board agree that the former should not be given, especially as additional accommodation might well have to be hired for it.

The second part of the proposal is designed to obviate the congestion that would otherwise occur in respect of admissions to the new separate course. It affects only candidates who have been, or may be, selected by Local Governments for direct appointment to the Provincial Service and who would, under existing arrangements, have been sent to undergo the third year course of training in due course. These candidates are :—

(i) Certain students now at the College who have completed the full two years of the Rangers' course in 1912 to the satisfaction of the President.

(ii) Candidates who completed the Rangers' course in previous years, but who have not yet undergone the

third year course owing to the limited number (15) admissible to that course each year, or to the fact that their Local Governments have wished to try them as rangers before sending them, and that they are still under trial.

To admit all these candidates to the new separate course would involve each of them undergoing four years' training at the College and Institute. It would also involve great delay in the admission to the new separate course of students now at the College, who have undergone the first year of the Rangers' course of training, and of candidates for direct appointment, who would, but for the change in the arrangements, have been deputed to the Rangers' course in April 1912. The latter have done their preliminary training and Local Governments have been instructed not to send them to the Rangers' course of 1912-14.

After fully considering the matter, the Board are of opinion that the number of candidates whose College training is incomplete under existing arrangements is so large that to admit all of them to the new separate course of training would cause great delay and inconvenience in respect of the further training of candidates who have already been selected. The Board also consider that the suggestion made by the President of the Research Institute and College affords the most satisfactory solution of the difficulty. It was resolved :—

(i) That as the new separate Provincial Service course will commence on the 1st November 1912, the third year course for 1912-13 be abandoned.

(ii) As regards candidates selected by Local Governments for direct appointment to the Provincial Forest Service and who would, under existing conditions, have undergone the third year course, the Board recommend that :—

(*a*) students who have completed the first year of the Rangers' course be admitted to the new separate course in November next, being employed in the interval as Local Governments may direct ;

(*b*) as an exceptional measure, Local Governments be empowered to appoint as probationary Extra Assistant Conservators without further training at the Institute, men who have completed the two years' course in 1912 to the satisfaction of the President, or previously, and who would normally have been selected by Local Governments for the third year course of 1912-13.

Resolution III.

The President of the Research Institute and College put before the Board for discussion the rules for the two courses of instruction at the College and Institute and the syllabus for the new Provincial Service course approved by the Board of Control of 1911 in their Resolution No. IV, with some important modifications rendered necessary by the orders of the Government of India regarding the new Provincial Service course, and a few others considered desirable. He also put up a note explaining all the proposed alterations and a second note pointing out some objections to Nos. 17—19 of the amended rules. After full discussion, it was agreed that the rules as now amended are satisfactory, except as regards Nos. 17—19, regarding which the Board desire to make the following observations :—

(*a*) Rules 17 and 18 deal with the selection of candidates by Local Governments and the powers of the President of the Research Institute and College to subject them to examination in English and Mathematics on their arrival at Dehra Dun. The second note submitted by the President of the Institute and College indicates the inconvenience and expense to which both Local Governments and the candidates concerned will be subjected to when candidates are sent down by the President owing to their inability to follow the course of instruction. In this connection it may be noted that the examination the President is authorised to hold cannot take place until more than a year has

elapsed after the selection and nomination of the candidates examined. The note also shows that none of the educational qualifications that may be prescribed by Local Governments afford any guarantee that a candidate's knowledge of English and Mathematics is sufficient to enable him to follow the course of instruction. Long experience has shown this to be the case, and the results of the final examination in elementary mathematics just concluded affords further proof of it. At the request of the Board, the President prepared a note showing the extraordinary ignorance of elementary mathematics displayed by the majority of the candidates deputed to the College.

In view of all the facts brought to their knowledge, the members of the Board unanimously consider that candidates for the Provincial Service course should be subjected to a qualifying entrance examination in English and Mathematics before being admitted to the Institute, and that such examination should take place before the candidates are nominated by Local Governments.

As it has been recognised that an examination in English and Mathematics is necessary, the Board think that it will not be inconsistent with the orders that this shall be held before a candidate is selected and not after he has joined at Dehra.

(*b*) Amended Rule 19 prescribes that on arrival at Dehra Dun candidates should undergo a physical test followed by a medical examination by a medical board. The Board consider that the health certificate prescribed by rule 26 (*c*) is perhaps sufficient proof of medical fitness and that for reasons similar to those mentioned in the case of candidates rejected for mental incapacity, the physical test should be undergone by candidates before their nomination, as is the case with probationers for the Imperial Service, and not after they join the Institute. Also that it may be left to Local Governments to prescribe the necessary physical test.

As regards the suggestion made by the Secretary of State in his despatch Revenue No. 8, dated the 19th January 1912, that it may be advisable to give the President larger powers of examination and of rejection than are proposed, the Board think that the necessity for the rejection of candidates after they enter the Institute should be avoided as much as possible, and that if an entrance examination in English and Mathematics is prescribed, no larger powers than are now proposed for the President will be required.

The Board submit the following resolution for the consideration of the Government of India :—

(i) That the rules and syllabus as modified by the Board be adopted, except Nos. 17 to 19.

(ii) That in place of rules 17 to 19 as modified, the original rules approved by the Board of Control of 1911 be adopted, subject to an addition to rule 18 to the effect that 50 per cent of full marks will be required to qualify in the entrance examination.

Resolution IV.

At the request of the President of the Research Institute and College, the Board discussed the question of stipends, and considered whether stipends have not been too freely granted of late years, and whether efforts should not be made to fill vacancies by the appointment of private students.

The following resolution was passed :—

The Board of Control are of opinion that the grant of stipends or scholarships on a somewhat lavish scale as at present obtains is not always in the best interest of the Department, and that when a student is aware that he is to receive a fixed stipend, generally the maximum permissible, and an assured appointment on his obtaining the necessary certificate, there is little inducement for him to do his best—provided he feels fairly confident of being able to obtain his certificate.

Under Resolution III it is proposed that the method of granting stipends or scholarships be enlarged [*vide* proposed new

rules 8 (*v*) and 28]. If the alterations indicated in these rules be adopted and made use of in the spirit in which the new rules have been framed, the result should be increased competition and better work among the College students, resulting in greater benefit being derived from the College education. In order, however, that there may be greater inducement to good work at the College and that Local Governments, etc., be not put to unnecessary expense in the way of stipends, it is suggested that it is advisable to draw their attention to the fact that in some provinces at least, where service in the Forest Department has attained a fair measure of popularity, it may be possible to obtain recruits without the offer of any stipend, on the promise of an appointment conditional on the ability shown by the candidate and the reports on him received during his College course, while in others it may be sufficient to offer appointments to selected students, granting such a comparatively small or even no stipend during the first portion of their training and until reports on them have been received, making the grant of a stipend or an increased stipend (or bonus) depend on these reports and on the ability, general good conduct and industry displayed. It is further suggested that if it is considered desirable to offer stipends or scholarships, such might well be competed for by nominated candidates in each province, etc., and that if this procedure were adopted, the unsuitable and indifferently educated student who is at the present time too often sent to the College almost entirely on the strength of some educational certificate or qualification which is no real criterion of his abilities or capacity for following the College course, as experience has proved time after time, would in great part tend to be eliminated.

MEETING OF THE BOARD OF FORESTRY.

It is understood that the Board of Forestry which met in March 1910 will hold its second meeting in March 1913 and that a representative from each province will be invited to attend. The Board will discuss the Research Institute programme for the following three years and any forestry problems that may be referred

to it for advice. Any subjects which officers may wish to see discussed should reach the Inspector-General of Forests by the 1st January next.

NOTE ON THE COPPICING POWERS OF BABUL.

When I took charge of this Circle, I was very sceptical as to whether the babul produced coppice shoots worthy of the name, but I soon had to lay aside my scepticism after seeing one of the Guntur reserves which has been regularly treated as coppice for a term of years.

I have now made enquiries and find that in the Circle there are four districts which are specially interested in this question, Guntur, Bellary, Anantapur and Chingleput. I will put aside Guntur for the present as Mr. Scot is, I understand, preparing an exhaustive note on the subject which will be published in the *Indian Forester*.

Chingleput.

In this district the observations were made by Mr. S. Kuppuswami Chetty, who is of opinion that big trees do not, as a rule, produce coppice but trees under middle age do. He is also of opinion that when the stools get submerged for some period, as in tank beds, the coppice shoots die, but in cases where the coppice shoots are able to keep their heads above water they survive. He also states that in stiff clays where the soil becomes much cracked in the hot weather that the young shoots die and, I may add, that seedlings frequently die off for the same reason.

In this district the Pulrambakkam Block has been worked since 1902-03 and the following is a resume of the information furnished.

Coupes XXII and XXIII, ten years old.

Soil, sandy clay. Coppice growth fair. Big trees have not given any coppice, but 75 per cent of trees 3′—4′ in girth have developed shoots.

Five trees with stumps of 12″ diameter had 16 coppice shoots varying in height from 18′ to 20′ and in girth, at breast height, from

10" to 22". The average girth of 16 shoots was 15". One stool of 14" diameter produced two shoots of 18' high and 19½' and 12" girth.

Coupe XXIV, nine years old.

Soil, water-logged. Only 10 per cent of the trees developed coppice. Four stumps varying from 9'—16' diameter produced 13 shoots of 18' to 20' high with an average girth of 14", the smallest shoot having a girth of 7" and the largest 24".

Two stools of 18" diameter produced six shoots 18' to 20' high with an average girth of 19".

I have taken the two latter separately, because they are unusually big stools to have reproduced, but it will be seen below that these are not isolated cases.

Coupe XXV, eight years old.

Conditions similar to preceding coupe.

Five stools of 7" to 15" diameter produced 16 shoots 9' to 18' high with an average girth of 12".

One stool of 18" diameter produced five shoots of 16' high with an average girth of 14".

Coupe XXVI, seven years old.

Conditions similar to coupes XXIV and XXV.

Five stools of 7"—12" diameter produced 14 shoots of 8' to 12' high and with an average girth of 8".

One stool of 19" diameter produced two shoots of 12' high and 10" and 12" in girth.

Coupe XXVIII, three to four years old.

Seventy-five per cent, all small trees, produced coppice and 25 per cent failed. Six stools of 12" to 15" diameter produced 27 shoots 6' to 10' high with an average girth of 4½".

In the two younger coupes coppice reproduction is successful.

Anantapur.

In this district the observations were carried out by Mr. C. Hodgson in the Pamidi reserve. The soil is described by him as a very deep slimy clay of light colour with a little sand mixed

through it, not very porous but not quite impervious. The rainfall is about 20 inches.

In compartments 5 and 6 saws were used and the month chosen for the felling (December) was also bad in Mr. Hodgson's opinion. No actual countings were made, but 90 per cent of the stools have failed. In the other compartments the axe was used and the trees cut as low as possible. Mr. Hodgson is evidently of opinion that the trimming of stumps has no effect on the reproduction by coppice, and he states that the great bulk of the shoots spring from close to the ground or just below and not from the cambium.

Unfortunately from this district we have observations on only young coppice, and the following gives a resumé of the observations :—

Compartment 7, sixteen months old.

No. of stools counted.	Dead.	Coppice.			
		Very good.	Good	Poor.	Very poor.
142	74	26	23	1	8

Mr. Hodgson thinks that only a portion of the very good coppice will survive and the rest fail. The following shows the size of the stools which have produced very good coppice :—

Below 8" diameter, $\frac{14}{43}$ or $\frac{1}{3}$.

About 8" do. $\frac{10}{17}$ or over $\frac{1}{2}$.

„ 1′ do. $\frac{2}{8}$ or $\frac{1}{4}$.

The height of the coppice varies from $1\frac{1}{4}$′ to 7′.

Compartment 8, seven months old.

No. of stools counted.	Dead.	Coppice.			
		Very good.	Good.	Poor.	Very poor.
43	7	17	11	6	2

Proportion of stools that have produced very good coppice.

Stools below 8″ $\frac{6}{16}$ or over $\frac{1}{2}$.

Do. about 8″ $\frac{7}{16}$ or less than $\frac{1}{2}$.

Do. „ 1′ $\frac{4}{16}$ or $\frac{1}{4}$.

The height of the coppice varies from $1\frac{1}{4}$′ to 5′.

Bellary.

Observations in this district were carefully made by Mr. E. M. Crothers in the Molagavalli Reserve. He believes generally that the best results produced are from stools cut flush with the ground. In dry, well drained situations stools cut higher than 3″ do not usually produce shoots, but those in depressions produce shoots when cut up to 6″ above ground.

One stool of 34″ girth cut flush has coppiced, but, as a rule, in this reserve stools up to 24″ girth produce the best coppice. Two sample plots of half acre each were taken, No. 1 in high ground and No. 2 in a depression, and the following shows the result:—

Age of coppice 6 years.

Stools.			Coppice shoots.		
No.	Counted.	Failures.	Average per stool.	Average height.	Average girth at base.
1	14	7	2·28	4′ 10″	$5\frac{1}{2}$″
2	17	5	2·46	7′ 11″	8″

It is of course dangerous to generalise from the small number of observations made, and we may well await the report from Guntur before doing so; but we may take it, I think, that we can rely on obtaining effective coppice in this Circle, when the trees felled are not of great size.

The working-plans are, as a rule, based on our obtaining coppice from trees which are not above 9″ diameter and, as far as our experience goes at present, this appears to be confirmed by the present observations made.

MADRAS: P. M. LUSHINGTON,
Dated 7th May 1912. *Conservator of Forests, C. C.*

COPPICING OF BABUL IN GUNTUR DISTRICT, MADRAS PRESIDENCY.

Some months ago an article appeared in the *Indian Forester* on the coppicing powers of babul, and reference was made to the areas in this district which are treated under a working-plan prescribing regeneration by coppice. I remember, on first seeing the working plan for this area, before I had been in Guntur, being surprised that the regeneration of babul by coppice should be contemplated under any working-plan; for I had always looked on the species as one which coppiced very indifferently, if at all. There can, however, be no doubt that under certain conditions babul coppices well. The result of observations in areas felled in the Guntur Babul Working Circle during the last eighteen years is given in the accompanying statement. The Working Circle comprises six separate reserves, aggregating 4,817 acres and situated within a radius of 15 miles of Guntur (longitude 80° 30′; latitude 16° 17½′). The climate is very hot, rising as high as 115° or over towards the end of May. The rains commence early in June and with occasional breaks extend up to the end of October, the average rainfall being 32·35 inches. Except for slight depressions, the areas included in the Working Circle are all level. The surface soil is black cotton with a subsoil of kankar overlying gneissic rock. All these areas have at one time been under cultivation and the babul growth is the result of natural reproduction. In 1893 a working-plan for these areas, prescribing their treatment as coppice leaving 5—6 standards per acre, was prepared by Mr. A. W. Lushington, and this was in force till 1906-07. Under this plan the area was divided into 20 coupes corresponding to the number of years in the rotation. In 1906, it was decided to change the system of working; the rotation was considered too long, and it was thought desirable to cover the whole ground in a shorter period.

The coupes were therefore grouped into six larger coupes, one of which was to be worked over in each year, felling only trees 6 inches diameter or over at base and removing approximately half the growing stock in volume. The plan covers the period 1908-09

to 1913-14, but the system of felling prescribed was given effect to in 1907-08.

It is noticeable that the rate of development in height and girth of the coppice shoots, especially in the case of coupes felled prior to 1907-08 varies between wide limits. For instance, coppice 18 years old in Coupe I of Nidamarru Reserve varies from 14 to 26 feet in height and from 10 to 23 inches in girth, and to a greater or less degree the same applies to the growth in other coupes. The reason is that the stools from which the coppice shoots have originated were at the time of felling of uneven age. Small stools seem generally to put out a larger number of coppice shoots than those of more mature trees, but on the latter, with better developed root system, the growth of the coppice is more rapid.

From a valuation survey in each coupe the average rate of growth of the coppice could be arrived at, but this would not be of much value, for it would represent the results of the felling of an uneven aged wood and would apply only to an uneven aged wood in which the age classes were represented in the same proportion. The higher figures for height and girth given in columns 3 and 4 of the statement represent the best results in each coupe and the lower figures represent backward development. The average is somewhere between, depending principally on the proportion of stools cut in the coupe when at the best age to reproduce by coppice. No observations have yet been undertaken to determine the size of stool from which the best rate of coppice development may be expected, but so far as one can judge by general inspection, stools 6″—8″ in diameter at base result in the highest rate of increment in coppice reproduction and stools of this size may generally be relied on to reproduce by coppice. Stools of smaller diameter produce, as a rule, a larger number of coppice shoots, but their development in height and girth is less rapid. The present working-plan prescribes that stems over 8 inches diameter at the base may be felled 6 inches to 9 inches above the ground level "as it is found that babul coppices, more certainly if felled a little above the ground level." I am doubtful if this is the case. I think it best to cut all stools so that about a third

of the cut circumference is flush with the ground and the cut surface slopes upwards to 3 inches to 4 inches above the ground on the opposite side. In any case, the coppice reproduction of stools over 8 inches in diameter is much more uncertain than in the case of smaller ones. I think the figures given in the table show beyond doubt that under certain conditions the reproduction of babul by coppice is by no means to be despised. I understand that the same has been found to be the case in other districts, and I have found it so in other parts of Guntur where the conditions as to climate and elevation, etc., differed considerably from those prevailing in the Guntur Babul Working Circle. I measured coppice shoots 8 inches and 9½ inches in circumference at breast height from babul stools on a tank bed in Palnad Taluk (longitude, 79° 30′; latitude 16° 33′) which had been felled less than four years previously. There were three or more large coppice shoots from almost every stool and the volume of fuel obtained by coppice four years after felling cannot have been much less than the quantity that had been actually felled.

Why babul coppices in some cases and not in others can be at present only a matter of opinion. My impression is that the conditions under which it may be expected to coppice well are these :—The soil on which it grows must be admirably suited to the species and the situation must be such that the ground is flooded or at least water-logged during part of each year, but the floods must not last too long or they will kill both the coppice shoots and the parent stool. These conditions apply to all the areas on which I have seen babul coppicing, and I think that it might be found that babul would reproduce by coppice over much of the foreshore of the tanks on which it is commonly found. This is of course pure speculation and recorded statistics of the period during which floods have lasted would be necessary to prove whether or not the hypothesis in regard to the period of flooding, effecting coppice reproduction, was correct. It would be interesting to fell a sample strip on a tank bed where babul flourishes, so that as the level of the water rose and fell, the strip throughout its length would be flooded for different periods and to

record accurate observations of the dates during which different portions of the strip were flooded. Of the areas under the Guntur Babul Working Circle, Nidamarru, Kuragallu and Kolakalur are best stocked and give the best results in coppice reproduction. All these areas are actually under water for some period each year. In a normal year, the soil probably becomes water-logged towards the end of June, is actually under water before the end of July and from then to the end of October is at times completely submerged and at other merely saturated with water. Lam, Gollamudi and Narakodur reserves are never completely flooded, but the soil is saturated with moisture from early in June till the end of October. In June 1910 there were exceptionally heavy rains and the coupes in Kolakalur and Nidamarru reserves were under water continuously for nearly $2\frac{1}{2}$ months. The result was that, owing to the number of stumps that died after these floods, the successful reproduction was reduced from 75·3 to 32·6 per cent. in Nidamarru Coupe II felled in 1908-09 and from 63·7 to 33·7 in Nidamarru Coupe I felled in 1909-10. The reproduction does not seem to have suffered so severely in the coupes felled in these years in Kolakalur reserve, probably the floods there were less severe. The percentage of reproduction in Kolakalur Coupe XIII was only 17·8 per cent, but in this coupe it was only 17·9 per cent from the stools of stumps felled in 1906-07. The soil in this coupe is not so well suited to babul, as there is a considerable mixture of red earth with the black cotton soil. I think in both cases this is the reason for the low percentage of reproduction in this coupe. Figures showing the percentage of reproduction have only been collected of coupes felled in 1904-05 and subsequent years. They have been arrived at by the enumeration of barren stumps and of stools which made coppice, on sample areas of 2 to 3 acres selected in each coupe.

J. S. Scot,
I. F. S.

INSECT INVASIONS AND METHODS OF CONTROL IN AMERICAN CONIFEROUS FORESTS.

It has been definitely proved in the United States that certain species of insects are the primary agents that bring about the death of vast numbers of trees in the extensive coniferous forests of that country. At times, owing to causes that are at present little understood, the balance of nature becomes upset to such a degree, that insect depredations may assume the character of a definite invasion. This not infrequently results in the death of a large proportion of valuable timber over thousands of square miles. It has been estimated that for a ten-year period the average amount of timber in the forests throughout the United States, killed and appreciably reduced in value by the work of insects, represents an average annual loss of nearly £12,500,000. This is upwards of £2,500,000 annually in excess of the average yearly loss of timber caused by fires calculated since 1870.

Forest insect investigations are under the charge of Dr. A. D. Hopkins, who is an officer of the Bureau of Entomology of the United States Department of Agriculture. The many reports that have issued from his pen during the last decade are models of thorough investigation. He has conclusively demonstrated that Scolytid bark-beetles of the genus *Dendroctonus* are the worst foes the pine forests have to contend with. They do not confine their attacks to weakly trees, but many species prefer to attack matured and healthy examples. The basis of Dr. Hopkins' monograph of the genus has been a thorough study of the structure and life-history of these insects, and a careful discrimination between the slight characters exhibited by the many closely allied species. Their life-histories, on the other hand, were found to frequently exhibit very marked differences. The future success of economic work in forest entomology depends very largely upon the correct description, interpretation, and recognition of the generic and specific characters. This work in itself involves a large amount of purely scientific research into anatomical and technical details, which may appear in the eyes of those whose work is of a purely administrative character to be

devoid of practical value. Nevertheless, practical discoveries have almost always been based at the beginning on purely scientific research.

As examples of insect invasions on the American continent the following instances are notable. In the years 1890—92 the southern pine beetle (*Dendroctonus frontalis* Zimm.) attacked and diffused itself over an area of forest amounting to 75,000 square miles. This area extended from West Virginia, through Maryland and Virginia into Columbia, northwards into Southern Pennsylvania and southwards into North Carolina. A very large proportion of the mature and young trees belonging to several species of spruce and pine were killed by this insect. The mountain pine beetle (*Dendroctonus monticola*, Hopk.), in one locality in north-eastern Oregon, is calculated to have killed in three years, 90—95 per cent of the lodge pole pines extending over an area of 100,000 acres. In the years 1900 and 1901 the eastern spruce beetle (*Dendroctonus piceaperda*, Hopk.), caused extensive destruction in the forests of north-eastern Maine. This attack was successfully controlled by confining the regular logging operations within the affected areas. The logs were placed in lakes and streams and floated down to the saw mills. With little or no additional expenditure, it resulted in a saving to one firm, according to its own estimates, of a sum exceeding £20,000.

In 1906 an extensive estate in southern Colorado suffered from an outbreak of the Black Hills beetle (*Dendroctonus ponderosæ*, Hopk.) This was controlled through the efforts of the owner who had some 500 of the infested trees felled and barked. This venture proved so successful that not a single infested and dying tree could be detected when the area was inspected two years later. Considerable unnecessary expenditure, however, was involved owing to the burning of the bark. This latter measure was not required, owing to the fact that the insects transform into the adult beetles within the inner bark. In such instances all that is necessary is the removal of the outer bark. Notwithstanding this unnecessary precaution, the value of the utilizable timber was stated as being more than enough to pay all the working

expenses. In the spring of 1907 this same species was ascertained to have effected 65,000 broad feet of timber in a large private estate in north central Colorado, a ranger having been specially deputed by the Forestry Service to make the examination. The owner was informed by the Bureau of Entomology, but did not take action. In the autumn of 1907 it was found that the hordes of the insect that had been allowed to emerge from the old infected trees had affected 240,000 broad feet of timber. This resulted in the owner agreeing to adopt the recommendations of the Bureau of Entomology, and 4,000 odd trees were cut down, the logs converted into lumber and the slabs burned. This course of action resulted in the desired destruction of the broods of the beetle. It is stated that the owner realised a sufficient revenue from the timber thus treated to cover all working expenses as well as leaving a profit afterwards of over $1,200. The forests were again examined, and it was found that this organised campaign resulted in a complete control of the ravages of the insect.

In such campaigns experience has shown that, as a rule, it is quite an unnecessary measure to attempt the total extermination of these bark beetles. The *sine quâ non* is to so reduce and weaken their forces that they are no longer capable of making an effective attack on healthy trees, but have to depend upon weakened and felled trees for their sustenance. On account of their small size the beetles have to occur in very large numbers before they can inaugurate a successful attack on healthy flourishing trees. Dr. Hopkins estimates that it is usually only necessary for from 50—75 per cent of one or more species in an infected area to be destroyed in order to render them subservient to complete control.

In India the first requirement for the foundation of a system of Forest Entomology is a thorough knowledge of the habits, economy, and life-history of each particular pest. As the life-histories of many insects occupy a period of three and even four years, the acquisition of such knowledge is both a slow and laborious process involving continuous and prolonged investigation. Such information once obtained is of permanent endurance, and

forms the basis upon which to devise all remedial and preventive measures. Until this requisite knowledge is available attempts at insect control are best left alone and, as Dr. Hopkins remarks, there is perhaps no other feature in the science and practice of forestry in which advice and application based on insufficient knowledge is so dangerous.

A. D. IMMS, B.A., D.Sc.

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UNLIMITED POSSIBILITIES.

The following lines were penned on hearing that the Forest officials of the————————district had been actually ordered by the————————to double the grazing possibility of a certain forest.

Under such orders an entirely new vista is opened out, the scope of which is unlimited. Should a province, for example, desire a few lacs more forest revenue, the Local Administration

or the Board of Revenue has now a precedent for ordering that the possibilities as laid down in the working-plans be doubled (or why impose any limit!), and that the new figures be duly worked up to, and *hey, presto*! the trick is done.

Data collected often with considerable difficulty, after long days in the sun succeeded by long nights of fevered unrest, are apparently apt to be considered in a certain province of the Indian Empire as of little account, in view of the superior knowledge, instinctive and inborn, as they have not had the experience by which alone it can be acquired, of the men in the shade.

"In a district that lies 'neath the blue mountain skies
The forests are wide and sufficient,
And the D. F. O's aim, which is always the same,
Is to render protection efficient.

To keep watch and ward o'er the ryot and guard,
Put down periodical blazing,
To banish the cow—'the poor man's'—you know,
And develop a system of grazing.

He worked at his scheme, both awake and a-dream
And suitable blocks he decided,
And the limits of head were fixed by the feed
That Nature had really provided.

But the powers that rule have thought him a fool
A really quite ignorant creature,
And shown that the feed of the jungly mead
Is settled by art and not Nature.

They say 'it won't do; you've allowed for too few,
'Possibility's easily doubled,
'It may go all wrong, but we're not here for long
'So some other man will be troubled.'

P'raps 20 years hence when bosses get sense
And forests more thoughtfully run,
Less mess will be made by the men in the shade
Of the work of the men in the sun."

SUGGESTIONS FOR KEEPING STANDING ORDERS AND WORKING ORDER FILES.

The following suggestions have been sent us by Mr. Hodgson, D. F. O., Belgaum, who thinks that possibly their insertion in the *Forester* will prove useful to other D. F. O's.

"Instead of Divisional Forest Officers issuing the usual Circular Orders to their Range Forest Officers, which are often lost, forgotten, or ignored, it is proposed, that two files of orders should be kept in each Divisional and Range Office as explained below.

I.—Standing Order File.

2. This file is intended to contain important orders only of a permanent nature. It is necessary to impress upon the Range Forest Officers that obedience to Standing Orders is imperative, and to punish adequately when they are disobeyed. During Range Office examination, the Range Forest Officer's Standing Order File must be compared with the Divisional File.

3. The file is subdivided into chapters, *e.g.*, Forest Offences, Demarcation, Leave to subordinates, etc., etc., and is supplied with an index. The orders in each chapter are numbered consecutively and new orders can, consequently, be added at any time.

4. From time to time even Standing Orders require revision, but, as a rule, each order, if carefully drafted, will stand for two or more years, and it is easy to effect the comparatively few modifications required once a year during the rains.

5. In any one Division, as a rule, a Standing Order will be applicable to all the Ranges. In the comparatively few cases in which this does not hold good, the Standing Order can receive the last consecutive number of the chapter to which it belongs plus a letter. This obviates all necessity for keeping separate files of Standing Orders for the different ranges. The orders can be in English, in a Vernacular, or in both.

6. At the commencement the drafting of Standing Orders involves considerable labour, but much trouble is saved afterwards: there will be uniformity of working, where such is desirable: a

new official, Divisional Forest Officer, or Range Forest Officer, can gain more knowledge in a day from such a file than he would acquire in a month if it were necessary to search miscellaneous files.

II.—Working Orders.

7. Like the Standing Order File, this is intended to contain important orders, but concerning current operations only. As a rule a Working Order would be carried out, and consequently die a natural death, within a year.

8. The number of Working Orders would be usually far fewer than of Standing Orders: hence subdivision into chapters is unnecessary. It is convenient to number the orders serially and to add a letter when the order is not applicable to all rangers.

9. At the commencement of a new year many of the last year's Working Orders would no longer be needed and any still in force could be re-numbered and dated, the old file being dropped. It is necessary to compare the Range Working Order files with the Divisional File from time to time.

10. It may be objected that these Working Orders are merely Circular Orders, but this is not exactly the case, for the existing Circular Order files are made up of a confused jumble of Standing Orders and Working Orders, and it is really difficult for any officer, even if he may not purposely wink at an order, to know what he is intended to carry out and what is time-barred."

CORRESPONDENCE.

TO THE HONORARY EDITOR, INDIAN FORESTER.

FIRE-PROTECTION IN THE TROPICS.

SIR,—In a very interesting article by Mr. Fischer in the May number of the *Indian Forester*, entitled "Fire-protection in the Tropics," an article of mine on "Fire-protection in Chir Pine Forests" is referred to, and it is quoted as trying to show that fire-protection prevents the regeneration of Chir. This is exactly

the opposite of the whole line of my argument, as the following extracts show :—

"That after years of burning, fire-protection gives an extraordinary and universal stimulus to regeneration ; that successful regeneration is possible only under the most favourable conditions without fire-protection.....the protection of an area from fire .....induces practically universal regeneration.

" I would briefly recapitulate the chief points which I have tried to show in the article—.....

" When fire-protection commences, regeneration springs up practically everywhere. In the uniform method (essentially suited to the Chir pine), regeneration is not required everywhere at once, but should be confined to regeneration areas and blanks. Fire-protection would certainly be advantageous.....in all regeneration areas."

Surely such remarks cannot be taken to mean that fire-protection prevents regeneration? I fear I must have expressed myself very badly to have given this impression. If regeneration is of urgent and paramount importance throughout the whole forest, fire-protection will help enormously to ensure it, but if we desire to try and regularise our forest, and confine the regeneration to its proper place, *i.e.*, the first periodic block, the regular burning of the remainder of the forest will assist us to this end, although, in very favourable cases, even burning is not sufficient to keep down the regeneration.

As regards the absence of regeneration in the fire-protected areas around Ranikhet, I pointed out that "some hitherto unrecognised causes may have been operating," that " I mentioned the point with some diffidence," and in fact that there was not sufficient evidence to prove that the absence of regeneration was due solely and only to fire-protection. This was in any case a minor point, applicable only to areas which had been protected for a long period of time, and when the time for their regeneration came round, the evils of long continued protection (the thick mat of accumulated needles, sourness in the ground, etc.,) could in many cases be easily removed by a preliminary firing. The main

point that I was trying to establish was that with the uniform method, firing that part of the forest not under regeneration was advantageous to keep the regeneration out, and that universal fire-protection was unnecessary to the same extent that universal regeneration was unnecessary.

The fact that Mr. Fischer has so misunderstood me shows that I must have expressed myself poorly, and possibly laid too great emphasis on the minor points, so to clear up any possible misunderstanding, I should be grateful if you could find room to publish this explanatory note.

E. A. SMYTHIES,
I.F.S.

NAINI TAL:
3rd June 1912.

CRYPTOSTEGIA GRANDIFLORA—ITS UTILITY FOR REBOISEMENT IN THE OUTER HILLS OF THE PUNJAB.

SIR,—One often sees words of wisdom in resolutions on technical reports but the following is hard to beat :—

"There is no doubt that the *Cryptostegia grandiflora* grows freely all over the province and may prove a valuable plant for reboisement in outer hills."

The Punjab Government having allowed cattle, sheep, and goats to destroy the valuable forests which the Almighty gave to their charge are now going to re-afforest with a climber!

"SORROWFUL."

SUGGESTED IMPROVEMENTS IN THE PENSION RULES OF THE IMPERIAL FOREST SERVICE.

SIR,—From a number of letters which have appeared in the *Indian Forester* during the last year or so (signed "Fed-up," "Disappointed," etc.,), it would appear that both the present pay and pension rules are not regarded as satisfactory by the service at large. Other departments are having their grievances enquired into by Commissions and remedied where they exist.

Would it not be possible for the Forest Association to emerge from its retreat and endeavour to get some of our more pressing needs satisfied?

The whole question was recently treated of in one of your articles and I think that nobody doubts the fact that the conditions under which we now serve are not all that they should be and that agitation on the subject is necessary.

With regard to what the exact scale of demands should be, I am somewhat diffident about making any statement as to an increase of pay. I think however that a request for—

(1) A pension of £400 at 20 years, £500 at 25 years, with larger pensions for those who have served a period as Conservator, Chief Conservator or Inspector-General.

(2) That the pensions for the years between 20 and 25 should increase proportionately, *i.e.*, after 24 years service an officer should get £480.

(3) That *invalid* pensions should be sterling and also increased to the following :—

After 10 years £200
After 15 years £300
After 19 years £380

with proportional pensions for the intervening years, could not be considered excessive in view of the trying conditions under which many of us serve.

It seems somewhat cruel to break a man's health by 10 years' service in an unhealthy province and then to give him a pension of only Rs. 83⅓ a month.

I should however like to hear the opinions of others on the subject.

"DIVES."

POSSIBLE MARKETS FOR CERTAIN FOREST PRODUCTS.

SIR,—In my article entitled "Possible Markets for certain Forest Products" which has appeared in the *Indian Forester* for July, I notice that I have made a mistake on page 311, which requires correction. It is stated that "the percentage of oil (*Schleichera trijuga*) in the seed is 56 per cent on the total weight of the seed or 25 per cent by weight of the kernel". It should read "25 per cent on the total weight of the seed or 56 per cent by weight of the kernel".

R. S. PEARSON, I.F.S.,
Forest Economist.

22nd July 1912.

REPORTS ON THE FOREST ADMINISTRATION IN BURMA FOR THE YEAR 1910-11.

(*Contributed.*)

The Government of Burma are indeed to be congratulated on their forest possessions, which comprise more than half the whole forest area at the disposal of the Government of India. Their forest estate of 137,000 square miles produced during the year ending June 30th, 1911, a profit of 66 lakhs of rupees, roughly half a million sterling, and it must be with great satisfaction that they realize that the action begun in the middle of the last century by Sir Dietrich Brandis has resulted in this magnificent property being consolidated and secured for posterity.

Covering almost 68 per cent of Burma and the Shan States, the forests stretch from Myitkyina in the north to the South Tenasserim border of the Malay States, and few are the districts that do not enjoy the benefits of their presence. In these few areas we find the usual trouble with the people, who, wedded to the wasteful methods of cultivation that have yielded a scanty livelihood to their ancestors for centuries, resent whole-heartedly any attempt to curtail their senseless and extravagant privileges. Thus we find from the report of the Conservator of Forests, Southern Circle, that in the dry zone in the Magwe district one proposed reserve was abandoned because the Local Government

was unwilling to pay a trifle of Rs. 32,000 to acquire a block of the scanty remaining forest, being at the same time reluctant to bully the inhabitants of a miserable village by paying them this sum and transferring them from a parched desert to a land, at no great distance, flowing with canal water and sessamum oil.

It is true that the duly demarcated and reserved areas only amount to nineteen per cent of the whole areas of the forests, but the unclassed forests, which cover 111,000 square miles, comprise many very well-timbered areas, often in the more distant districts, and we gather that increase of population and subsequent extension of cultivation will not be allowed to pass unregarded by the local Forest Officers, who tour all over the forests under their charge. Reservation will in such cases, we trust, follow the increase of population, as it must do if the needs of the nation of the future are to be considered.

The source from which the revenue is derived is still in great part the Burma staple, teak, 47,000 tons of 50 cubic feet having been extracted by Government, and 262,000 tons by purchasers usually lessees of the forests. The revenue from the former may, judging from the reports, be put at least at Rs. 50 per ton, and from the latter at Rs. 19 per ton, so that the gross revenue from teak was not less than 74 lakhs, or 70 per cent of the total revenue for the province.

Seventy-two per cent of the teak came from Upper Burma, which contains 55 per cent of the total forest area and now furnishes the lessees with large quantities of timber from the more recently opened forests. It is certain, however, that this large extraction of teak cannot continue. The exceptionally large outturn during the year under review was partly due, as remarked by the Chief Conservator, to most of the old purchase contracts lapsing at the end of 1910, and to the lessees making efforts to get as much timber as possible measured under the old rates in cases where rates under the new agreements are higher. It is probable also that the amount of teak available in future years will decrease owing to the exhaustion of the supply of the naturally dead trees which have been searched for and extracted from almost all the

forests by the lessees. These trees had been accumulating in the forests, and it is only comparatively recently that the increasing difficulty in obtaining easily-worked timber has led the lessees to penetrate to the more distant forests to collect all the outlying and scattered timber.

The other main items of revenue were, 8 lakhs received for minor produce, 2 lakhs for bamboos and canes, 2 lakhs for firewood and charcoal, 2 lakhs for duty on foreign timber and other produce, and 11 lakhs for woods other than teak (Pyinkado, 4½ lakhs, other reserved woods 1 lakh and unreserved woods, 5½ lakhs).

We are told disappointingly little about the sale of the Mergui Rubber Plantation, but gather that the amount received was large, from the substantial portion, 4½ lakhs, paid during the year. The remaining revenue from minor produce appears to have been chiefly realised from the following :—

1. *Cutch.*—Rupees 1,49,000. According to the Conservator of Forests, Pegu Circle, there was a brisk demand from Europe and a good deal of the manufacture was undertaken by villagers whose crops had failed. We trust it has been found possible to cope with the adulteration which has been giving Burma cutch a bad name.
2. *Lac.*—Rupees 82,000. This was mostly derived from the Shan States. Experimental cultivation carried on in the dry zone again proved a failure as the seed lac imported from the Southern Shan States had nearly all swarmed before arrival. We would suggest that this work be put in charge of a specially trained Officer, if that has not been already done, as it demands considerable care and attention.
3. *Rubber.*—Rupees 21,000. The greater part of the rubber was collected in the Northern Circle, in the distant forests of Myitkyina.
4. *Wood-oil.*—Rupees 12,000.
5. *Cardamoms.*—Rupees 2,000.

6. *Dammar.*—Rupees 2,000.

7. *Barks.*—Rupees 15,000

8. *Grazing.*—Rupees 8,000.

9. *Miscellaneous.*—Rupees 85,000.

Little information is given about these products and the last item probably includes sums realised under headings 4 to 7, as the different reports are not equally detailed. In view of the efforts made of recent years by the Department to develop the trade in minor produce, a detailed list in Form 63 would be interesting and useful.

Firewood and charcoal, bamboos and canes, articles of universal use, yielded almost the same revenue as during the previous year.

Almost all the duty on foreign timber is collected at the mouth of the Salween River, and the Conservator, Tenasserim Circle, says :—" There has been a steady decrease in the duty realised at Kado on foreign timber which amounted to only Rs. 2,01,256 as compared with Rs. 2,56,788 in the previous year and Rs. 2,79,961, the average of the preceding five years. The cause is obviously the exhaustion of the foreign sources of supply, *viz.*, the forests of Siam, Karenni, and the Shan States."

The development of the trade in woods other than teak is especially interesting, as they must become more and more important as the amount of available teak decreases, and the demand for timber in Burma and from other countries increases. The more valuable timbers are classed as *Reserved Woods* and the other as *Unreserved Woods* and the quantities extracted, without including fuel, were, in tons of 50 cubic feet :—

	1910-11.	1909-10.
Reserved Woods	79,000	72,000
Unreserved Woods	2,48,000	2,37,000
Total ...	3,27,000	3,09,000

The trade in woods other than teak is principally in the hands of native firms, but it is to be hoped that European firms will in time find it worth their while to export the best of these timbers to Europe.

The trade in Pyinkado is growing, and it is satisfactory to note that 48,500 tons of this plentiful and valuable timber were extracted, including 103,000 sleepers and 2,400 tons, which were converted into sleepers, supplied to the Burma Railways Company. The Conservator of Forests, Southern Circle, says :—" The Upper Burma Wood Company has been given a purchase contract for seven years to work the Yeni Reserve forests for Pyinkado on the condition that they offer one lakh of narrow-gauge sleepers a year to the Burma Railways Company. Revenue will be paid on the logs which will be carried by a light line nearly eleven miles to Yeni Railway Station, and there sawn up at a new mill they are erecting."

Little information is available from the reports about the remaining 30,500 tons Reserved Woods, but we note that there was a decrease of 6,000 tons in the Pegu Circle, and that the trade in Padauk seems to have almost ceased. The names even of the other species that were in demand are not to be found as a rule, and we suggest that some of the columns in Form 62, now blank, might with advantage be altered so as to show these details, as on them depends a proper appreciation of the extent to which Burma timbers may be pushed in the markets of Europe, a matter which is yearly receiving more attention.

A similar reticence is displayed with regard to most of the unreserved timbers, only a few items of interest being noted. The Hon'ble Mr. Lim Chin Tsong extracted 906 tons from the Pegu Division for the supply of his new match factory in Rangoon, but we are not told of what kind. *Shorea obtusa* and *Pentacme suavis* have been tried in Upper Burma for sleepers, but so many were rejected by the Railway Company that the work did not pay and has ceased.

The number of teak trees girdled is almost exactly the same as last year, amounting to Rs. 1,12,500, indicating the large extent

to which the girdling is now regulated by working-plans for reserves and girdling schemes for unclassed forests. The number girdled outside reserves is also the same as last year, 35,000, so that a regular yield from these forests may be anticipated for some years to come.

In connection with the floating of teak in Lower Burma two interesting works are described by the Conservator, Pegu Circle, undertaken to prevent the loss of logs which are carried out of the shallow streams in the Prome and Tharrawaddy Divisions during the rains. In one case a boom was made by Mr. Jeffery, Deputy Conservator of Forests, across the Wegyi stream to catch the logs during a flood, so that they might be taken out and railed to Rangoon, and in the other a new channel was cut for the Bawbin stream where it joins the Myitmaka River, at the suggestion of Mr. Ellis. Both these works have been successful up to date and will probably greatly facilitate extraction.

The number of Forest offences reported shows a small increase due, as the Conservator says, to the closer control which is being obtained over the forests by the establishment which is gradually increasing.

Progress made in reservation, demarcation, surveying, and the preparation of working-plans was not great, but was, as a rule, sufficient, most of the important work under these heads having been already completed. Although 12,000 square miles of reserves are still without topographical maps, the greater part of this area is doubtless included in district surveys, and the area of reserved forests to be taken under survey is given in Form 54 as 8,341 square miles only.

The important heads under which expenditure on improvement of forests was increased are, communications and buildings, fire-protection, plantations and improvement fellings.

We are glad to notice that the area of *taungya* teak plantations was not largely added to during the year, and desire to emphasise our opinion recorded last year on this subject, and to record the hope that these plantations will not be made in future unless there is urgent necessity to give villagers land for cultivation. We note

that in the Minbu Division 170 acres of mixed teak and cutch *taungya* plantations were added during the year, and shall be interested to hear whether these do any better than other mixed plantations of this kind which have not, we understand, been a success in past years.

The total revenue from plantations up to date comes to about 2 lakhs, the cost from the beginning being 24 lakhs, and almost the whole of the revenue seems to have been derived from rubber and a few acres of old teak plantations near Rangoon; so it is worthy of consideration whether enough has not now been spent on plantations, and whether it should not be seriously recognized that, after the requisite attention has been given to existing plantations, improvement fellings should be put in the forefront. The Chief Conservator says:—

"It is to be regretted that the reports show that this most important work (improvement fellings) is not being carried out satisfactorily on a sufficiently large scale, and that in many divisions it is either totally neglected or done imperfectly and under inadequate supervision by trained officers. Judging from the areas gone over and the cost, in some cases it would appear that the work was either done in a perfunctory and unsatisfactory manner, or was not really required and that the money could have been better spent on work in more suitable forests. It should be unnecessary to point out that improvement fellings badly executed are a waste of money, and that for the present at all events the work should be concentrated as far as possible in areas where teak is likely to respond quickly to the operations and where skilled supervision is available." Rupees 58,000 was spent on working over 85,000 acres.

Another point in the same connection is the amount spent on the experimental cultivation of exotics, and we are glad to find that the opinion we expressed last year is shared by the Conservator, Northern Circle, who says:—"The writer is of opinion that much time and money is expended on the experimental cultivation of exotics which serve no useful purpose and which might be more profitably utilised."

We hope, therefore, that planting, both of teak and exotics, will be discontinued, and that the Department will rest content with the ·5 per cent of the reserves that has been planted up. More time and money will then be available for the much-needed extension and supervision of carefully carried out improvement fellings.

Fire-protection was successful but expensive, having been attempted over 7,500 square miles or 29 per cent of the whole area of the reserves, and costing Rs. 37 per square mile successfully protected. 96 per cent. of the area attempted was successfully protected. In the Eastern Circle of the United Provinces the cost per square mile during the same year was Rs. 22 and in the Western Circle Rs. 20, the percentages attempted of the total area of forest in the circles being 69 and 81 respectively. The cheapness of labour in the United Provinces accounts for the difference.

When we come to the work done under the head of Communications and Buildings, we are unable to offer congratulations to the Government of Burma. With the forests yielding a net profit of 66 lakhs, we find from Form 56 that less than 3 lakhs were spent on Roads and Buildings, the items which make up the amount being as follows :—

	Rs.
New buildings	1,17,000
Repairs to buildings	52,000
New roads	91,000
Repairs to roads	29,000
Total ...	2,89,000

In the United Provinces from the same form we find that the amount spent was Rs. 1,89,000, the net profit from the forests being 13½ lakhs and the total area of forest under the Department being 13,000 square miles. Without counting the unclassed forests in Burma, the area of the forests in Burma is therefore twice that in the United Provinces, and the net profit during the year 1910-11 was five times as great.

There is no comparison between the present state of the roads and buildings under the Forest Department in the two provinces. Burma at present merely beginning the work that the United Provinces have almost completed, yet there is no sign that the Burma Government are making efforts to bring the forests up to a fitting condition in respect of roads and buildings. The great difficulty in obtaining money recently alluded to by the Lieutenant-Governor of Burma has doubtless had much to do with this state of affairs, but we trust that when money is available, a department which can show such handsome profits will be treated in a more generous way as regards funds for such obviously necessary works as buildings, and such obviously revenue-paying works as roads.

A good word is said for fire-protection by the Conservator of the Pegu Circle who attributes good natural regeneration of Pyinkado in Henzada to this cause, but the Divisional Officer of South Tenasserim says :—" Reproduction of Pyinkado is distinctly pronounced in areas burnt by fire, and is almost absent, if not entirely absent, in reserves, due undoubtedly to the dense moist nature of the forests."

A general flowering of *Melocanna bambusoides* the single growing hill bamboo, occurred over 400 square miles in Arakan, and is expected, according to local opinion, to continue for five years on adjoining areas, the last flowering having taken place about forty years ago.

It is hoped that a use will shortly be found for the enormous supplies of bamboo in Burma, as the Forest Economist visited some of the forests in connection with an enquiry into the sites available for paper-pulp mills, and the industry appears to offer a promising future.

At the end of the report we find the epitaph of the Burma Kheddah Department. Its work seems to have been fairly successsful both from the point of view of the Kheddah, and of the villagers, who were glad to have the wild herds removed bodily from their neighbourhood, but the malign fate which has pursued the Kheddah since its transfer to Burma has dealt the final blow

in the order of the Local Government for its sale. The Superintendent is confident that the Department has not had a fair chance and that it could be made to pay "while efficiently performing the main object of keeping down elephants in the province—an administrative necessity that admittedly exists." 219 elephants were captured during the year, 180 died and 57 were sold or otherwise disposed of, leaving a balance in July 1911 of 171. We understand that no purchaser has yet come forward, and we are surprised that none of the firms largely interested in elephants for the purpose of timber extraction in Burma have found it expedient to take over the Kheddah and thereby obtain a practical monopoly of the supply.

SYNTHETIC JUTE FROM WOOD-PULP.

Many rumours of jute substitutes have, from time to time, been recorded in these columns, but not one of them has ever come to anything for the sufficient reason that jute refuses to thrive anywhere out of the hot, steamy climate of parts of India, and particularly of Bengal and Assam. At all events, no one has been able to grow a fibre that can, in the matter of utility combined with cheapness, compete with jute. But what about the possibility of a sort of synthetic jute, *à la* synthetic indigo, camphor, and so forth? Not many people have thought of that; but, according to some authentic information that has reached Calcutta, something of that sort has been evolved in Germany. From information that has reached us, the idea seems to have originated in Belgium, where, it seems, its full value was not realised. A sharp German Syndicate, having amongst its members two influential German princes and a leading financier, perceived the true scope of the opening and bought up the patent, taking care not to pay too much for it.

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Like all good patents should be, this one for the manufacture of a jute substitute is a delightfully simple one. The various uses of paper yarn, which is a product of wood-pulp, have been known

for some little time now, and most people have heard how this astonishing yarn may be converted, among many other things, into "velvet pile" carpets, and, in the form of cellulose, into clothes. The idea of the Belgian inventor was to add additional strength to paper yarn (which was already reasonably strong), and this he accomplished by simply adding a percentage of cotton waste to the wood-pulp. The result, we are informed on excellent authority, is a yarn equal in strength to that of jute, but capable of being woven into a texture so fine that bags made from it are exactly suited for the packing of cement ; that is to say, they are dustproof.

* * * * * *

But a more important consideration is that bags so made are being sold at about twenty per cent below the price of corresponding jute goods : while, under existing conditions, there is said to be a profit of over one hundred per cent, which will be still further increased as the price of jute falls. A factory of some three hundred looms has been opened at Oppeln, Germany, to work the patent, and great things appear to be expected ; but we venture to think that an extended trial will be necessary before really definite conclusions can be drawn.

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But a powerful factor that stands in the way of the extended manufacture of this alleged jute substitute is the growing scarcity of timber suitable for the manufacture of wood-pulp. Each year this shortage grows more apparent in all parts of the world, and prices of this pulp are steadily, if not rapidly, mounting towards the point of prohibition. It takes somewhere between thirty to a hundred years to grow a tree for use as paper-pulp ; jute galore matures in a single year, and can afford to smile sweetly at the wood-pulp tree. Jute wins the growing race, hands down. Even taking the new substitute at its face value, the greater the demand it sets up for raw material, the more costly it must become, for there is only a limited quantity of wood-pulp to go round, barely enough to supply existing needs, and by no chance can the supply be increased in less than thirty years, but more likely sixty would be required. The German Syndicate must really find a substitute

for wood-pulp, or their patent is not destined to disturb the jute world to any great extent. It is one thing to evolve a clever patent and quite another thing to work it on a commercial scale. Many a Syndicate has discovered that fact before to-day.—[*Capital.*]

FOREST WASTE CAUSES FAMINE.

By President John T. Procter,

Baptist College, Shanghai.

China's life-sapping famine, in which millions are suffering, is largely traceable to the wasting of the forests. One of the most horrible tragedies of the world might have been prevented by the careful use of these resources.

"China's hills and mountains are deforested. This is particularly true in the hilly country drained by the Yangste river, whose valley comprises the stricken district. The river brings the soil down with it. That is the reason why we have the Yellow sea. For three hundred miles out from land the ocean is discolored by the silt brought down by the Yangste. The hills are washed bare of soil. There is some hunting in these hills, but the animals live among the brush. For want of better fuel the natives burn this brush.

"Last August the Yangste overflowed and flooded about 40,000 acres of densely populated territory. This flood placed a population of 3,000,000 in want. In fifty years there has not been such another flood. Some of the victims have been drowned out for two consecutive years, some three years, some four years. They not only have lost food, they have lost hope.

"Much of the land that was inundated is at sea-level. It is drained by the most intricate system of canals in the world. I know of one city of 30,000 which is surrounded by canals. There are no roads to it because a road could not go half a mile without touching a canal. There are not even footpaths. The people make their way to and from the city in boats. This is their only means of communication."—[*American Forestry.*]

POSSIBILITY OF GROWING CORK IN INDIA.

The contraction in the supply of cork has been apparent for some years, and has given rise to higher prices. Cork is not grown in India ; but, in the opinion of experts in forest economics who have been consulted on the subject, there is no known reason why it should not be grown on the warm and dry slopes of the hills of the various ranges. As is fairly well known, cork is the developed outer bark of the cork tree, the *Quercus suber*. It is not until the tree is 25 years old that the bark is cut, and fresh cuttings take place every eight or ten years, the tree itself living for about 150 years. The usual method of cutting the bark is to make longitudinal and transverse incisions, which admit of the cork being removed in semi-cylindrical pieces by means of a curved knife. Great care is required in the cutting, so that the inner bark may not be injured. The detached pieces are soaked in water, pressed flat, dried, and superficially charred to remove any decayed parts and to conceal blemishes. They are then packed in bales for the market. The chief sources of supply are Portugal and Spain, and in both these countries steps are being taken to restrict the export trade and thus secure still higher prices.

As regards Portugal the *Times* pointed out some time ago, that in consequence of the action of the Government in promising to the cork operatives that, in future, all cork wood must be manufactured into corks before leaving the country, a large number of cork merchants, many of whom are English, are unable to fulfil their contracts for the delivery of cork wood in other forms than that of corks. The merchants in question made representations to the Government showing that this decision would practically compel them to close their factories. The Government, however, replied that they must abide by their action in consequence of the engagements given to the operatives.

As regards Spain, the *Journal* of the London Chamber of Commerce has stated that during last December a meeting of the principal representatives of the cork industry in Spain took place in Madrid, when, in view of the shortage in the raw material

resulting from poor crops and large exports, it was decided to urge the Government to raise the export duty on cork wood from five to fifty pesetas per 100 kilos (equal to about Rs. 15 per cwt.) in order to provide a remedy for the crisis through which this industry is passing. The report of the British Chamber of Commerce for Spain states that the Ampurdam Valley and the Provinces of Estremadura, Jaen, Sevilla, and Huelva have large plantations of cork trees, the produce of which is eagerly sought by Spanish and foreign manufacturers. During late years the relatively low level of duties has enabled the foreign buyer to compete advantageously, with the result that the national industry has been to some extent paralyzed for want of working material. The aim in view, therefore, is to raise the price of cork wood for foreign manufacturers, in which case the demand for Spanish cork from abroad would be considerably reduced and native manufacturers benefited. The measure would also have the effect of creating a number of new industries of cork objects which at present Spain is obliged to import from other countries. At the termination of the meeting, the representatives visited the Prime Minister and the Minister of Finance to put before them the decisions arrived at Both Ministers promised to study the matter carefully, and, if necessary, to promulgate a law for the due protection of national manufacture.

Cork is exported in five forms, *viz.*—(1) lumps or slabs; (2) small squares; (3) corks; (4) sawdust and shavings; and (5) finished articles. The Spanish cork trade, which was formerly confined to the manufacture of corks, has been developing considerably for some time, as a result of the greater diversity of uses to which waste cork is being applied. This waste consists firstly of cork sawdust, shavings and scraps. These were formerly of no particular use, and were employed mainly for packing fruit, especially grapes. These have now become raw materials and are applied in many ways, thereby originating a certain number of new industries. A good deal of the waste cork is exported to the United States where it is largely used as insulating material in the form of bricks, the particles being compressed under great

heat and adhere firmly to each other without the addition of any binding material.

The imports of cork into India in 1911-12 amounted to 1,784 cwts. valued at Rs. 1,50,209. Rubber is used in various ways as a substitute for cork, but it is not yet certain how far the future course of rubber prices will affect such use. It seems, however, possible that experiment might advantageously be made with a view to growing cork in this country.—[*The Indian Trade Journal.*]

SOME INDIAN VERMIN.

The vermin that infest the forests and mountains of India form a considerable factor in the causes contributing to the diminution of game in this country; and, in undertaking the preservation of game, measures should be inaugurated for the destruction of such vermin as is harmful to the animals and birds included in the list for preservation.

In considering this matter, it would be necessary to catalogue the various species of animals, birds and reptiles to be placed on the black list; to review their particular attributes; to enquire into the question as to whether their misdeeds in regard to the destruction of game are counter-balanced by any benefits they may confer in other directions; and finally to decide the means that should be undertaken for their destruction.

Generally speaking, in adopting measures for the destruction of carnivorous animals, the authorities concerned have condemned only those beasts which are dangerous to human life, or which prey on domestic animals. Tigers, panthers, wolves, bears and hyænas are usually included in the list of animals for the killing of which rewards are paid, the two latter perhaps with scarcely sufficient reason, for the bear is a comparatively harmless animal, seldom threatening either human life or that of domestic creatures, whilst the hyæna is more of a scavenger than a beast of prey (although he is rather apt to display a partiality for donkeys) and the good he does in this respect most assuredly counter-balances the fact that he may occasionally be responsible for the death of a village

goat. We think this unsavoury creature might be left in peace to confer a benefit on the public by keeping down the pariah dogs, whilst the rewards now paid for the production of his somewhat mangy skin might be devoted to more deserving objects.

It is, however, unnecessary to consider any of the above-mentioned animals in discussing this subject, as rewards are generally paid for their destruction throughout India, although it may be interesting to note the fact that in one Native State infested with tigers, rewards for the killing of these animals have been discontinued. This at any rate is a step in the right direction—from the sportsman's point of view.

But it seems to us that the question of predatory animals, even if they are destructive to game only, should also be considered, especially in view of the fact that certain species appear to be on the increase. First on the list we would place the wild dog, regarding whose extensive depredations we are receiving constant complaints. In localities where they were seldom met with in years gone by, large packs are now constantly seen, and, being such ruthless and persistent hunters, they doubtless destroy vast numbers of deer and such like harmless denizens of the forest. In some districts, indeed, they appear to have almost exterminated the game, so that it is not improbable that before long they will turn their attention to domestic animals, which they are said not to molest as a rule, although we have many recorded instances of their attacking and destroying cattle.

Having no natural enemies, he is able to increase and multiply without molestation. The habits of this creature are favourable to the adoption of measures for its extermination. Strychnine or other suitable poison might be used on the carcases of animals killed. By this means whole packs could be destroyed simultaneously, and it would appear to be a more certain method than any other for encompassing the destruction of this species of vermin which infests most of the jungles of India from Kashmir to Cape Comorin, killing wild sheep and antelope in Tibet, and slaying vast numbers of sambur and spotted deer throughout the Peninsula.

The misdeeds of other animals pale before those of the wicked red dog. Perhaps the next in order of demerit is the marten, found in the thick mountain forests of the Himalayas, Burma, and the Nilgiris. Although so numerous as to be very destructive to game, these animals are seldom met with unless sought for, owing to their arboreal habits. Colonel Ward, in his "Sportsman's Guide to Kashmir and Ladak," mentions having seen three of these creatures run down and kill a half-grown musk deer close to the place where he was encamped, and other observers have noticed them in pursuit of their prey, sometimes hunting in packs of five or six. Doubtless also they kill the young of many other animals—four-horned antelope, barking deer, and such-like, which inhabit the forests where they are found, and they take toll of the pheasants, chukor, and other feathered game.

Possibly we should have considered the various species of wild cats, some of which are most destructive and blood-thirsty, before the martens. Probably the most harmful of these, by reason of its abundance and extensive range, is the common jungle cat (*Felis chaus*), which commits depredations on the peafowl, hares, partridges, and also on occasion attacks the birds of the farm-yard. Jerdon mentions that one sprang out of a sugar-cane field, and seized and made off with a peafowl he had just shot. With the exception of trapping and shooting, stimulated by the grant of rewards, no methods of destruction suggest themselves for application to the wild cats. Other game-killing animals of this genus are the fishing-cat, the rusty spotted cat and the tiger-cat, whilst to these might be added the two species of lynx, the caracal and the Tibetan lynx, both of which, although blood-thirsty and harmful to game, probably do not exist in sufficient numbers to call for special attention. The caracal preys mostly on hares, gazelle, and peafowl, whilst the Tibet lynx is said to confine itself principally to blue hares, but the information regarding these animals is somewhat scanty owing to their scarcity and nocturnal habits.

The civet is a creature very destructive to birds and small mammals, so should not be spared when met with, and the palm-civet or toddy-cat has been accused of poaching, but is probably

comparatively harmless. The jackal, although somewhat mischievous at times, is chiefly a scavenger, whilst the various species of foxes appear to prey principally on insects, although they will doubtless not despise birds and small mammals, especially when met with in the snows of the Himalayas. If to this list we add the egg-stealing crows, the various birds of prey—such as eagles and hawks—our list of game-destroying vermin in India will be fairly complete. But it is especially and primarily to the wild dog, and in a secondary degree to the wild cats and martens, that we would direct the attention of those interested in the preservation of game.—[*Indian Field.*]

UNIVERSITY OF OXFORD.

Delegacy for Instruction in Forestry.

The Delegates propose to appoint an Advisor in Forestry for a term of three years, to commence on the 1st October, 1912, or as soon after that date as may be possible. The salary will be £400 a year, and the travelling expenses, while on tour, will be paid.

The Advisor will work in connexion with the Oxford School of Forestry; he must be well acquainted with the theory and practice of forestry both at home and abroad. His duty will be:—

(1) to advise owners of woodlands within certain counties as regards the management of their woods;

(2) to study in detail the local conditions in those counties, and to impress the advantages of systematic management of woodlands on the owners;

(3) to assist the officers of the Board of Agriculture in the selection, treatment and supervision of experimental plots, and in the collection of statistics.

Applications, accompanied by not more than three testimonials, will be received by the Secretary to the Delegates, at the School of Forestry, Oxford, up to the 21st September, 1912.

W. SCHLICH.

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SYLVICULTURAL RESEARCH FROM A FINANCIAL STANDPOINT.

The idea sometimes held by those unacquainted with the aims of sylvicultural research, that any expenditure on this branch should justify itself by an immediate increase of revenue as a direct result, is an entirely fallacious one, and is opposed to all experience connected with industrial development as applied to natural resources.

2. It can hardly be denied that scientific research is the basis on which the successful exploitation of most natural products has to rely. The financier relies on the scientific assayist to furnish him with correct details regarding the prospects of the gold mine in which he proposes to sink his money, and on him, not on the minor who digs the gold, lies the initial responsibility. The promoters of a rubber company do not go to the rubber broker for advice regarding the potentialities of the estate which they bring into successful bearing but to the planting expert.

3. As regards the value of scientific research to a planting industry it will suffice to quote one comparatively recent example,

that of the discovery, by the research staff at Periadeniya in Ceylon, of the phenomenon of " wound response " in Hevea rubber trees. This phenomenon which is characteristic of Hevea but not of all species of rubber, consists of the fact that the production of latex is greatly stimulated in the immediate neighbourhood of wounds, so that by continuing to tap successively on the edge of existing cuts a greatly enhanced yield is obtained, so much so that the recent enormous development of the rubber industry in the East, and the high yields obtained, are largely if not entirely the outcome of the discovery of this simple scientific phenomenon of wound response.

4. Sylvicultural research may be divided broadly into (1) experimental work and (2) statistical work. Economic forest working, based on correct financial principles, depends on a combination of both, and one of the chief aims of sylvicultural research is to obtain the highest possible money yield from the forest capital by (1) ascertaining the best cultural methods of working under given conditions, and (2) determining mathematically the capital (as represented by the growing stock) and the rotation which will produce the highest net money yield per acre. This applies both to natural forest crops and to plantations, existing and contemplated.

5. It may be argued that local forest officers are quite capable of managing the forests under their charge, and that special expenditure on sylvicultural research is therefore not warranted. It is certainly true that a capable forest officer can manage his charge to the best possible advantage just as the commander of a battleship can navigate his ship and work his guns. In the latter case, however, it is the metallurgist who is primarily responsible for the quality of the armour plating and of the gun-barrels, on which the efficiency of the ship depends, and it is the chemist who invents and manufactures the explosives which propel the projectiles. The commander has not ordinarily got the time or the opportunity to elaborate new inventions, though he may suggest them and give them practical trial when completed, and it is his business to take advantage of the increased efficiency promoted by such inventions.

So the local forest officer may suggest lines on which improvements in forest working may be elaborated, and may to some extent carry out experiments: the details of experimental and statistical work on a sufficient scale, however, require to be carried out by a special staff in order to ensure continuity and comprehensiveness, which is not ordinarily possible in the limited confines of a forest division, where changes of officers are frequent. No further proof of this is necessary than to instance the many requests for information and assistance on sylvicultural matters which are received by the Forest Research Institute from local forest officers, whose chief aim is to increase the efficiency of their methods of working in order to enhance the value of the forests under their charge and to increase their yield.

6. Assuming now that expenditure on sylvicultural research has to be justified by a more than corresponding ultimate increase in the net revenue of forests—a view which is not an unreasonable one to adopt—we may consider briefly how this can be accomplished.

7. In the *Indian Forester* for March 1912, Mr. A. D. Blascheck, in drawing attention to the remarkable absence in Indian forestry of any attempt to gauge the forest capital and to work the forests on a rotation which will produce the highest money return on that capital, makes the following apt statement :—"To obtain some idea of the magnitude of this capital, and how it varies with the rotation, it is only necessary to consider the case of an ideal forest in which all ages of trees are represented in such proportion as to provide for a sustained annual yield. In such a case if the rotation is 100 years the value of the immature crops ascertained by discounting their ultimate value with three per cent. is over 30 times the annual yield. And if in the same forests the rotation were 150 years and all ages of trees proportionally represented, the value of the growing stock would be three times as great. The capital employed would be trebled. In other words, the yield with a 150 year rotation must be about three times as great as with a 100 year rotation in order to produce the same financial results Obvious and simple as this may seem, the disregard of all such

considerations is one in respect of which the present forest policy in India is open to criticism. Gratifying as the increases in revenue and surplus may be, is it not time to enquire in many cases whether the results are commensurate with the capital employed?" These remarks naturally apply only to forests worked as money-making concerns of which there are vast areas in the Indian Empire.

8. In Saxony, where the progress of systematic forest management has been carefully recorded since 1817, the net returns from forests, after paying all possible items of expenditure, rose steadily from 4 shillings per acre per annum in that year to 21 shillings per acre per annum in 1903, an increase of 425 per cent. These figures represent the average for the whole of the Saxon state forests, including good, bad and indifferent forest. There are forests in this state growing on land not worth 5 shillings per acre for agricultural purposes which produce over 40 shillings per acre net revenue per annum. The forests are composed chiefly of a single species—spruce—whose sylvicultural requirements have been intimately studied and regarding which comprehensive statistics have been compiled, so that the relations between the forest capital and the maximum net revenue obtainable have been calculated to a nicety. This is merely one example: continental forest management, based on financial principles, can show many such, and the far-seeing Germans at any rate employ a special staff for statistical work, recognising its value in economic forestry.

9. In order to fix the "financial rotation," that is, the age at which forest should be felled in order to produce the highest possible return on the capital, a comparatively simple mathematical calculation in compound interest is involved. Why then, it may be asked, do we not proceed to apply this calculation to our forests and work them at the greatest profit? The answer is simple—first our knowledge of the requirements of even our principal forest trees is incomplete, and second, the statistical information at our command is inadequate and in many cases unreliable. The obvious remedy is to perfect our knowledge of the requirements of

our trees and to collect reliable statistics regarding their growth, in other words, to spend more money on sylvicultural research, with a view to recouping it manyfold later.

10. Another direction in which much improvement is desirable, from a financial point of view, is that of cultural work generally, and in particular the formation and tending of plantations. No financier would sink capital in the formation of a rubber plantation unless he had first obtained reliable expert advice as to the prospects of the concern, and had worked out the capital cost, recurring expenditure and probable receipts. And yet the amount of money lost by Government in unsuccessful ventures in plantation work has been considerable, the main reason being lack of data on which to base estimates. Money spent on experiments on a small scale is well justified on the ground that a reasonable proportion of experiments, if intelligently conducted, may be calculated to afford results of economic value. There is little excuse, however, for repeating mistakes and conducting unsuccessful experiments on a large scale in one locality after another: yet this has often been done, the main reason being that most of the information regarding experiments soon becomes lost or is not available, and even successful methods of cultivation, though known in one locality, may be unknown in others. It is one of the chief aims of the sylvicultural branch of the Research Institute to ascertain what has been done hitherto in plantation work in various localities, to experiment further where necessary, and to endeavour to ascertain the most profitable methods of cultivating forest crops under different conditions. It is of great importance that the work of collecting statistics in existing plantations should be pushed on, for without these it will be impossible to form estimates in the case of plantations contemplated in future, and without reliable estimates it will be impossible to put a check on the waste of money which has been a characteristic of some of the past efforts to establish plantations.

11. One of the chief aims of forest policy in India at present is the development of the forest resources of the country by the

construction of export works and the establishment of new markets for forest produce. In this connection one is apt to overlook the fact that unless improved sylvicultural systems of working the forests are introduced such development works will seldom pay the profits they should do, and may frequently result in failure. The great majority of Indian timber trees grow scattered over large areas of country, and even in the case of gregarious species the trees of marketable size are generally scattered widely among smaller trees of all ages. It requires no great effort to realise that if 150,000 marketable trees can be concentrated within 5 square miles instead of being scattered over 150 square miles, the cost of constructing export works for their exploitation will be greatly diminished, and the profits of the undertaking will be enormously enhanced. So much is this the case, that one of the greatest obstacles to financial success in the construction of export works in the forests of India at the present time is the fact that the marketable trees are too widely scattered to pay the cost of extraction. This condition of things can be improved only by the introduction of suitable sylvicultural systems, whereby concentration of working can be effected. These improvements cannot be introduced off hand without initial experiments, as the sylvicultural requirements of our timber trees are not sufficiently understood. Here again sylvicultural research must lie at the bottom of economic forest working.

12. Recent investigations have shown that there are good prospects of developing an industry in bamboo pulp for paper making, and a new and extensive source of forest revenue would thus be opened up. Should a heavy demand for bamboos over a certain tract thus arise, there would be considerable danger of over-working the more accessible areas : on the other hand if the bamboos are too lightly worked the area operated over would be unnecessarily large, and the cost of working would be greater than it should be. The correct method in which to work bamboos is at present a debatable question, which is receiving attention owing to its importance in certain parts of Northern India, where some of the bamboo areas have become impoverished through over-

working. It is desirable that experimental work in this direction should be pushed on in the case of those species of bamboo which are likely to form the main sources of pulp supply.

13. Another point in connection with bamboo working is the physiological fact that certain kinds of bamboos, including the two species which will form the bulk of the pulp supply in Burma, flower and seed gregariously over large areas at intervals of many years, and having seeded the clumps die, while the new bamboos resulting from the seed takes several years to reach exploitable size. In the event of a general flowering, a pulp factory depending on one species of bamboo would thus have its entire supply of raw material cut off for several years. Information is being collected from past records regarding the periods of seeding, and steps are being taken to record any future seed years of the chief bamboos. Information regarding the time taken for bamboos of different species again to attain exploitable dimensions after seeding, and the extent to which the gregarious flowering of the different species takes place, is very meagre. As the success or otherwise of the bamboo pulp industry depends largely on these physiological questions which can for the most part be cleared up by sylvicultural research, it follows that this branch of research has an important bearing on the financial success or otherwise of the bamboo pulp industry.

14. Many further examples could be quoted showing the importance of sylvicultural research in its direct bearing on the financial results of forest management in India, but those given will have to suffice. Were correct financial principles and rational methods of working, based on the results of sylvicultural experiments and statistics, applied to Indian forestry generally, it is impossible with the meagre data available to estimate what the annual gain to the revenues would ultimately be: given an adequate staff, the gain would probably not be reckoned in lacs but in crores.

15. From what has been stated regarding the aims of sylvicultural research, it will be seen that the narrow-minded view that one rupee spent on Monday should produce two rupees on

Tuesday is an unreasonable one. The time taken for sylvicultural research to show a money profit must of necessity depend on the subject dealt with. The ultimate gain to the State through the adoption of rational methods of sylviculture and forest finance has been amply proved in Europe. The adaptation of similar methods to the varying conditions of climate and vegetation in India, wherever they can be successfully introduced, is a matter of the greatest importance from a financial standpoint. With this object in view, expenditure on sylvicultural research is more than justified.

R. S. TROUP,
I. F. S.

FIRE-PROTECTION IN THE TROPICS.

In the May number of the *Indian Forester* Mr. Fischer has put forward what purports to be a comprehensive review of all that has been written on this subject, and I am embarrassed to find that I am responsible for sixteen out of the nineteen points selected by him as being the principal objections to fire-protection.

The points he has selected, however, are not the ones I should have chosen myself. For instance, point V is a foolish suggestion of mine that the destruction of dead leaves might be partly due to dessication. It is well known, however, that botanical specimens, etc., can be preserved indefinitely, merely by keeping them dry. Again point XII contains a suggestion that when leaves are eaten by insects, these insects may be preyed upon by other insects, and these by insectivorous birds, and these by birds of prey, etc., so that a long time may elapse before any nutritive material is restored to the soil. This is of course very puerile, but these and several other suggestions and surmises quoted have little significance, and can have little bearing on the main question.

I have therefore made my own selection of what I consider the most essential points, and shall endeavour to show that they are supported by adequate evidence. Although I have no experience outside Burma, I shall endeavour to discuss the question

in as general a manner as possible, but as according to my views the conclusions to be drawn on some points must vary according to local conditions, I can in such cases only attempt to show what the result is in Burma.

I.—Fires are of great antiquity and therefore a determining factor in the present distribution of species.

The evidence on which I base this belief is—

(*a*) that taungya cultivation, one of the principal causes of fire, is one of the earliest forms of cultivation, as is proved by the fact that this method of cultivation is still practised by primitive tribes throughout India and, I believe, Africa. Some years ago it was attempted in Burma to protect one huge block of forest, comprising part of three divisions, but a fire which crossed the fire line in one place, burnt over practically the whole area in spite of every effort to check it. It seems reasonable to suppose, therefore, that very few taungya fires would suffice to cause the greater part of the deciduous forest to be burnt over. The origin of fires may therefore, I think, be traced back to dim prehistoric periods when the use of fire and cultivation was first discovered ;

(*b*) that innumerable species can exist in these forests, and possess considerable powers of resistance to fire. It can perhaps best be realised how extraordinary this is, by comparing the powers of resistance to fire of the species found in Europe where fire is of rare occurrence. I do not believe, however, that evolution has played much part in adapting species to resist fire, for instance it seems to me highly improbable that the power of coppicing, or the habits of grasses and bamboos, have been developed by natural selection for this purpose. When fire first originated, much destruction must have been caused, but this would give an opportunity to the survivors to increase

and take their place, and it is probable that in the course of time some immigration has taken place. It seems to me, however, that there is reason to believe that evolution has played some part, although perhaps slight, in improving the powers of indigenous species to resist fire.

Although I should expect that the conclusion in question is applicable to India, I need hardly point out that it does not apply to all tropical countries. Judging by the slight powers of resistance, I am, for instance, inclined to agree with Mr. Fischer that "in North America forest fires were formerly neither as frequent nor as widespread as in the present time."

11.—Fire-protection disturbs the balance or equilibrium of the natural growing stock.

In his review Mr. Fischer appears to indicate that fire-protection must be either beneficial throughout the tropics, or the reverse, but as I view it, protection may be essential in one locality, of little importance in a second, and disastrous in a third. Our ignorance of the relation of one species to another is, however, so great, that I do not think it possible to predict with much confidence whether a particular species will gain or suffer, and therefore, I maintain, it is a matter which must be determined by careful experiment and observation. A few notes I have made on the subject may be of some interest, but I cannot vouch for their accuracy. Usually I have found that light demanders suffer, apparently because the degree of moisture is slightly increased and the growth becomes more dense so that moist loving shade bearing species are favoured.

In pure tree forests, and possibly in most types of forest, fire-protection appears to result in a greater volume of material, occasionally thickets of new poles being found which evidently originated at the time that the area was first protected, proving that formerly the area was not as fully stocked as it might be. Owing to the longer duration of their life, trees appear to be handicapped as compared with species of grass and bamboos,

and it is possible that some species of trees, although capable of continuing the race by moderate powers of resistance to fire so long as they are young and vigorous, yet succumb prematurely before they have attained large dimensions. Although it may seem strange, it is quite conceivable that, even in the case of one particular species, fire-protection may be beneficial in one locality and injurious in another. A species becomes scarce on the one side because the rainfall is insufficient and on the other because the rainfall is excessive, and it is possible that fire-protection, by slightly increasing the moisture, may assist the species in its competition with other species towards the dry extreme of its range, but be injurious on the other extreme. The species with which a particular species is associated may also affect the question. For instance, opinions have been expressed that fire-protection is unnecessary in Burma where teak is associated with bamboo, but necessary in India where it is found with an undergrowth of grass.

As we are trained in the artificial forests of Europe where the forests consist more or less of a series of what out here we should call plantations, I think I am justified in again putting forward a quotation from Darwin.* "Nothing is easier than to admit in words the truth of the universal struggle for life, or more difficult—at least I have found it so—than constantly to bear this conclusion in mind. Yet unless it be thoroughly engrained in the mind, the whole economy of nature, with every fact on distribution, rarity, abundance, extinction, and variation, will be dimly seen or quite misunderstood."

III.—In Burma teak has suffered under fire-protection.

This is one of the most important points on which the whole question is based. It is not sufficient to determine merely that teak has suffered, but it is essential to ascertain to what extent. This information is, I think, supplied by Mr. Troup's statistics. They were collected in a typical teak bearing area and it is generally admitted that they give a reliable estimate of the injury throughout moist teak forest generally.

* Origin of Species.

Mr. Fischer comments on the "bewildering situation" created by the extraordinary diversity of opinions, and a similar perplexity is apparent in the recent practice of referring to fire-protection as a "vexed" question. All that this amounts to is that opinions based on ocular estimates are of little value, and do not give us any right to suppose that an attempt made to solve this question on orthodox lines would present any difficulty. In the same way, if for working-plans purposes we attempted to regulate the yield by means of ocular estimates, we should inevitably get most fluctuating results, and create a similarly bewildering and vexed situation.

I must also refer to a quotation put forward by Mr. Fischer as a serious objection. "If fire is to be considered as an agent favouring teak at the expense of all (or almost all) other species, and if the teak forests have been burnt over for hundreds of thousands of years, it is pertinent to enquire why we do not find large areas of pure (or almost pure) teak forests."

The relation of one species to another is so complex that it is impossible to explain why one species is abundant and another scarce. This I should have thought would have been fairly obvious, and in any case little would be gained were it possible to answer such an enquiry ; but if such an utter lack of comprehension of the economy of nature is displayed on this point, is it not probable that in Burma we are placing in jeopardy the natural growing stock of teak, which after all is our main source of revenue and not to be despised, without clearly understanding the risks involved ?

I am entirely in favour of utilising the forces of nature where possible, and it is obvious that in many cases fire-protection may disturb the normal balance to the gain of the species it is desired to benefit, but when it is found that this is not the case, it seems folly to persevere. We know that the natural tendency of every species to increase is kept in check by the competition of other species, and when this check cannot be mitigated by indirect means, the only alternative seems to be to try direct means, and to cut back inferior species wherever they are doing harm to our valuable species.

IV.—As the extent of the damage caused by fire is one of the most important considerations it is essential to make reliable valuations and to compare this with the cost of protection. In Burma, for instance, the value of the damage is comparatively small.

In reviewing this important point Mr. Fischer may have intended to be impartial, but his objection that "as Mr. Rodger has shown that this depreciation extends to 60 per cent of the crop one is justified in enquiring whether Mr. Walker is prepared to rest content with a 40 per cent standard of soundness" reeks of prejudice.

Mr. Rodger explained that only 8 per cent of the trees examined by him were rendered unsound, and it is an exaggeration to include a further 52 per cent as unsound when it was clearly stated that their commercial value was not affected. Further it is doubtful how much of this injury should be put down to ordinary leaf fires, as he attributed a great part of the injury to the serious conflagration of 1852 which must have taken place after the general flowering of the bamboo. He did, however, suggest that in the case of the 52 per cent the exposure of the dead wood would pave the way to further injury, but the trees examined by him were already mature and were selected for girdling, and it is immaterial therefore whether, had they been left standing, the injury would have extended. He was perhaps thinking of immature trees for which however he collected no statistics. The appearance of the scar however generally indicates that the injury is not recent, and has not been kept open or increased by subsequent fires. This however could have been inferred from Mr. Rodger's statistics, as if every immature tree which had been scarred by fire were to be further injured by each successive fire, the percentage of trees of which the commercial value was appreciably affected at maturity, would be very much greater than 8 per cent.

As regards the general principle involved Mr. Fischer expresses an opinion that it is "somewhat superfluous to produce evidence in support of fire-protection." It is true that he quotes many opinions, although mostly those of a former generation

which had not our opportunities of observing the effect of continued protection. Under our organisation opinions have an entirely fictitious value which varies according to the official position of the owner, and not according to the reasons on which they are based ; but opinions when based on ocular estimates are not necessarily sound evidence, and I cannot admit therefore that Mr. Fischer's industry has given us a final solution of the question.

It is not only not superfluous to produce evidence in support of fire-protection, but extremely desirable to do so, not only that we may be in a position to rebut the charge that we are wasting public money entrusted to us, but that we may make a fairly approximate estimate of the progress we are making. It seems however rather elementary having to point out that forestry is largely a question of rupees, annas, and pies, but in India this is very usually ignored.

It is true that in Volume III of Schlich's Manuals of Forestry no suitable formula has been given, but the calculations present no serious difficulties, and with Mr. Rodger's statistics it is possible to make a fairly reliable estimate of the damage caused by fire and to compare it with the cost of protection. Different results may be expected owing to different methods of calculation and different allowances for average volume of tree, value, rate of interest, etc., but both the late Mr. Slade and myself have published calculations showing that the value of the damage is so small that even by increasing these allowances to the utmost, it is impossible to bring it within measurable distance of the cost of protection.

There is an element of humour in comparing our troubles here and in the United States of America. In the latter our colleagues, although the service is of recent origin, have gone to work in the orthodox manner, but although their statistics of the damage and cost of conservancy operations prove that the scheme of protective works proposed would be a wise and remunerative measure of insurance, their allotment has been severely cut down ; whereas in Burma where nearly everyone acquainted with local conditions is convinced that protection is not required, money for this purpose is showered upon us. If perhaps we think that, in

neither case have the powers that be, displayed the wisdom of a serpent, yet we at least may console ourselves with the reflection that it is much pleasanter to suffer under a light hearted and reckless extravagance than a tight fisted meanness. The comparison is the more extraordinary as I understand that in the States the finances are flourishing, whereas in Burma they are at present in such a state that one would expect expenditure to be carefully scrutinized.

V.—The fact that hollow trees are sometimes found in unprotected areas cannot in the majority of cases be attributed to the action of fire.

The 8 per cent of mature trees rendered unsound by fire comprise only simple cases where the damage has extended from the outside, but in addition to this I understand it is claimed that the burning back of the seedling causes injury which frequently results in the tree ultimately becoming hollow, although intact on the outside. If however hollowness were due to this cause I maintain that it would be possible to trace the development of the decay at all stages of growth, but of the saplings I have examined, in no case have I been able to find that the injury has extended. So far as I can ascertain also the decay in the taproot due to repeated burning back is subsequently entirely enclosed in living tissue, and I believe, although I cannot remember on what authority, that decay cannot develop without access to air. Hollow trees certainly are found, but they are not restricted to areas burnt over. For some reason or other most tap-rooted species display a tendency to become hollow in later years. Many of our over-mature teak trees become hollow, but in England old oak trees tend to become hollow in the same way, and therefore it seems reasonable that the cause should be the same in both cases, namely, old age. Suppression frequently produces the symptoms of old age, and I have observed in plantations in protected areas, where of course the seedlings have never been burnt back, that some of the badly suppressed stems show traces of decay at the core. I do not know how the percentage of hollow trees in Burma

compares with that of Padauk in the Andamans, but although the latter are never subject to annual fires hollow trees are not unusual.

I have little doubt in my own mind that old age and suppression are frequently causes of internal decay, and am uncertain whether this is disputed or not, but the facts so far as I have been able to observe them do not support the view that there is any connection between the burning back of a seedling and internal decay in later years.

VI.—Other injuries may in some localities be of greater importance than that of fire. In Burma for instance the competition of inferior species is more detrimental to teak than fire.

Assuming that fire-protection does not indirectly benefit the species we desire to favour, the question depends mainly on whether the injury caused by fire is sufficient to justify the cost of protection. As however the work which can be attempted in a tropical forest is limited, it is necessary to consider, even if fire-protection does pay, whether the available funds could not be utilised to better purpose in other ways. Since however I have recently discussed this aspect of the question in great detail as regards Burma, I need not relabour the point.

VII.—Fire does not cause impoverishment of the soil.

We have had abundant opportunities of seeing areas of deciduous forests cleared for field crops, and it seems to be generally admitted that the soil is exceedingly fertile and contains abundant supplies of nutriment, sufficient to support field crops for some considerable time without recourse to manure or artificial fertilisers. It is not perhaps possible to compare our growth with that of the fireless forests of Europe, but the growth as a whole seems sufficiently good to justify the belief that the soil in our deciduous forests is not deficient in any essential food material. Nevertheless it has been asserted most emphatically and dogmatically, with a "there can be no doubt" or "it is not disputed," etc., that fire does impoverish the soil, but in scrutinising such expressions of opinion I have come to the conclusion that such opinions are

based, not on the actual state of growth, which is a matter on which every forest officer should be able to express a reliable opinion, but entirely on theoretical grounds to which I will refer later on.

In this connection Mr. Fischer quotes the following statement :—"After an area has been subject to fires for a great number of years the soil often gets into a very bad state, and it may take many years of protection to bring it into a suitable condition to form a seed bed for the principal species" and adds that these remarks seem "pregnant with significance." To me they seem uncommonly tough. Unless Sal is more exacting than a field crop, it would follow that when the forest is cleared for cultivation, no crop could be grown unless the area were heavily manured or allowed to lie fallow for many years, and I should doubt that such is the case. Although it is rash to criticise observations in a locality of which one has had no experience, yet on general principles I should feel inclined to attribute the tardy appearance of Sal, not to the badness of the soil, but to the habits of the species with which it is associated. In Burma in some taungya clearings, grass springs up densely and retards for a time the growth of bamboo and trees which are the original and natural species of the area. Similarly tree growth flourishes in the same area as bamboos, but in a flowered area no tree reproduction is possible for some considerable time until the bamboo nears maturity and opens out. It is rather extraordinary, but not contrary to my views, that the effect of fire-protection in disturbing the balance and altering the proportion of species in a locality should be retarded, and then be suddenly conspicuous, but I should find it difficult to believe that this result was due to impoverishment of the soil and I would suggest that this belief be tested by applying different fertilisers to ascertain exactly what food material is deficient.

These comprise in my opinion the only important points which have to be taken into consideration in determining whether fire-protection should be continued or not, and for which, therefore, accurate information according to the local conditions is absolutely essential.

The remaining matters I consider merely of academic interest especially in Burma where teak occurs more plentifully on ridges and on poorer soils. Not that teak will not thrive excellently on rich deep soils, and in a moist climate—in Arakan for instance the growth of teak in plantations is as rapid as anywhere in Burma, but as the rainfall is excessive it is not indigenous—but that it is crowded out by other species, and being a light demander can establish itself more plentifully where the competition is reduced by the physical poorness of the soil.

These matters have, however, been exploited as serious argument in favour of fire-protection, and therefore I think it is necessary to scrutinise the evidence.

VIII.—Earthworms in the tropics are not such an important factor in promoting the fertility of the soil as in temperate climates, and are comparatively scarce.

The subject is discussed in sufficient detail by Professor Drummond in his "Tropical Africa" which may be referred to. His conclusion is practically that given above, and therefore I do not consider it necessary to discuss the point.

Mr. Fischer claims on the authority of M. Jacquot that one of the results of fire is the migration of earthworms, but in the tropics it seems to me highly improbable that earthworms remain close to the surface during the hot weather. They remain, I believe, in the subsoils where there is still moisture, and are, therefore, not affected by superficial leaf fires.

IX.—Decomposition in the tropics is very rapid and the result is practically identical with that of combustion.

I have expressed an opinion that in a protected area the dead leaves disappear very rapidly during the rains. This has been disputed, but surely it is a matter which everyone can verify from his own personal experience. Although insects may help, this is, I think, mainly due to bacterial activity, which is greatly increased in warm tropical countries. In his translation of "Incendies en Forêt" Mr. Fischer uses the expression "decomposed by fire" and the following quotations show that there

is no practical difference between natural decomposition and combustion* :—" In decaying, plants return to the air and earth the materials of which they were constructed," and again† " decay and burning are simply different rates of progress of the same change." The effect of *slow* decomposition which results in the formation of humus and vegetable mould is very much more complex, and is well known to be beneficial to the soil, but, admitting that decomposition is exceedingly rapid in the tropics, it seems futile to insist that the beneficial effects of slow decomposition are realised.

X.—There is no deficiency of nitrogen in deciduous forests.

Mr. Fischer has very unkindly made me responsible for the opinion "either that nitrogen is not an essential plant food, or that it remains in the ash," and maintains that both conceptions are false. I quite agree, but I have never expressed any such opinion. On the contrary I have always been careful to admit that the question of nitrogen offers the principal difficulty, on the grounds that it is one of the most important plant foods, and the one most liable to be exhausted, and because, when leaves are burnt, the nitrogen is dissipated into the atmosphere, whereas the supply required is taken up by plants through the roots.

In Europe it has been established by M. Henry, M. Detrié and others that forest crops obtain their supplies through the power of slowly decomposing vegetation (humus or mould) to retain and increase the store of nitrogen in the dead leaves. But *gradual* decomposition appears to be essential.‡ Thus " nitrates cannot be formed in the rapid or putrefactive stages of decay, but only later when the process proceeds so slowly that oxygen is in large excess." This applies equally to his contention that the nitrogen in the dead bodies and *fæces* of leaf-eating creatures is wholly restored to the soil. A familiar instance is the pungent odour of stables due to the dissipation into the air of compounds containing nitrogen.

* Sir J. H. Hooker's Botany Primer.

† Cousin's Chemistry of the Garden.

‡ Johnson's " How Crops Feed."

He concluded that "it seems impossible to deny that annually recurring fires must diminish the quantity of nitrogen in the soil until, at the long last, the amount left is insufficient to support a forest crop." As however there is almost exactly the same loss when fires do not occur, the conclusion applies equally to a protected forest. The supply of nitrates, however, is not inexhaustible, and therefore it is mathematically demonstrable that, if the loss was not made good in some way, the supply would have been exhausted many years ago, and we should have no forest crops at all. Growth is however luxuriant enough and it follows therefore that however plausible Mr. Fischer's theories may be, they must be unsound.

It appears however to be definitely proved that* "the formation of nitrates goes on most rapidly in hot weather and in hot climates," and again† "in Bengal, during the dry season, when for several months rain seldom or never falls, an incrustation of saline matters, chiefly nitrate of potash, accumulates on the surface of those soils which are most fertile, and which, although cultivated during the wet season only, yield two or three crops of grain, etc., yearly." If the supply of nitrates can therefore be maintained naturally in the tropics for exacting field crops there does not appear any danger of a deficiency for forest crops. The fixation of nitrogen in a form in which it can be taken up by plants appears to be due to micro-organisms and therefore it may be a dispensation of nature that, as the absence of true humus is due to one form of bacterial activity, the supply of nitrogen should be maintained by another.

The result of the Rothampstead experiments appeared to me to throw still further light on the question. The subject was discussed in "Nature" and so far as I remember, one experiment was described proving that the benefit derived from burning branches on a field (known I believe as *rab*) was due, not so much to the ash as to the heating of the soil, and so far as I could gather the opinion of experts inclined to the view that even hot sunlight

* Johnson's "How Crops Feed."

† Ibid.

exercised a beneficial effect. Mr. Fischer objects on the grounds that the nitrogenous fixing bacteria are themselves destroyed, but the experiment described appears conclusive.

Mr. Fischer concludes that as the result of combustion the nitrogen of the dead leaves is entirely lost. So far as I can ascertain the result of combustion, rapid decomposition of dead leaves and putrefaction of the dead bodies and *fæces* of leaf-eating insects is almost identical, namely, to dissipate the nitrogen into the atmosphere, not as pure nitrogen, but mainly in the form of ammonia compounds, and that much of the nitrogen may be restored to the soil by the first showers of the rains. So far as I can judge however this is an entirely negligible source of supply, and the main source in the tropics appears to be due to nitrofixing organisms which have the power of fixing nitrogen from the atmosphere.

XI.—The expansion and contraction of the soil consequent on alterations of dryness and moisture contribute towards fertility.

In his general conclusions Mr. Fischer states that forest fires are injurious as they result in dessication and lack of aeration, but he does not indicate how this conclusion is arrived at. An expert, to whom I was introduced last time I was on leave, informed me that it was highly probable that the contraction of the soil in the dry weather, which is enhanced by the heat of fire, contributed to fertility by the disintegration of the soil, and by the aeration due to air replacing the moisture evaporated. The effect seems comparable with that of frost or tillage.

XII.—The loss of minerals in leaf ash through the agency of wind and water does not result in a deficiency.

I have been credited with doubting whether there is any loss whatever, whereas I have merely wished to protest against exaggeration on this point.

Mineral salts required by plants are taken up by the roots and are therefore soluble in water, and it follows therefore that a considerable loss must result even in protected areas owing to the surplus water being drained off into streams. If Mr. Fischer

admits this, as I think he must, does he find himself driven to the conclusion that, as the loss is recurring, the amount left must, at the long last, be insufficient to support a forest crop?

Alluvial deposits brought down by a river, whether from areas habitually burnt over, or from areas where fire is unknown, are invariably extraordinarily rich and fertile, but does it follow that the areas from which the silt has been derived have been ruined? Much is made of the fact that every trace of ash is removed by the wind, but if a few ashes are well pulverised and scattered broadcast on a perfectly calm day it is equally difficult to find them, although it is certain that they have not been carried away. Rub a few ashes well into one's clothes, and it is found they are tenacious and not readily removed. Keep a handful for a few days and it is found that even in dry weather they become slightly moist, having attracted hygroscopic moisture, and are still less likely to be wafted long distances. Put a few ashes in water and it may be seen that they are distinctly heavy.

On no points are the opinions quoted by Mr. Fischer more overwhelming and authoritative and he states that he could cite many more. We have the clear evidence of our eyes that the smoke of a smoky town and the dust of the dusty road are not carried great distances, and yet we are to believe that the comparatively heavy ashes left by a fire are entirely wafted away by the wind, and washed away by the first rush of the rains. One wonders at the folly of Burmans continuing to cut *taungyas* on hillsides at all. In Arakan I can vouch for the fact that the slopes in the administered Hill Tracts are unpleasantly steep, yet although windstorms are frequent in the hot weather, and the rainfall somewhere in the region of 200 inches, the poor ignorant hill people imagine that they get excellent crops of paddy from their *taungyas*. Little do they know that it has been conclusively proved that not a particle of ash can remain.

XIII.—Floods do not materially decrease in areas protected from fire.

In my opinion there is an appreciable difference in the floods during the rains and in the amount of water found in the hot weather, but my experience is in Burma that for purposes of

calculation it is not necessary to make any deduction for the increased difficulty of floating logs out from a protected area, or any allowance for abundance of water in the smaller streams during the hot weather. Unless the differences represent some value in cash it seems to me that they are immaterial. Mr. Fischer however makes me responsible for a statement I have never made, and he sarcastically suggests that my experience must have been very limited.

I do not deny that my experience is limited. I have no idea of the extent of the damage caused by fire, nor of the manner in which protection has affected the relation of the species in Madras for instance, but I have restricted myself to the teak forest of Burma with which I am well acquainted. It seems to me however that this wideness of experience is not altogether an advantage when, for instance, it results in a conclusion that the beneficial effects of humus in a French forest must be equally present in a tropical forest, or that because Sal is affected in a particular way the effect on teak must be identical. In the Administration Report for 1900-01, Southern Circle, the following passage occurs:— "Several Forest Officers still give expression in official reports to the fallacy that fire-protection is inimicable to natural reproduction of teak in its earliest stages, an erroneous idea which less superficial observation has generally dispelled." It is evident that this opinion was sincerely and strongly held, but as has so frequently happened the author was transferred to Burma late in his service, and in view of the overwhelming evidence on this point, it is impossible to avoid the conclusion that his opinion was based, not on actual facts in Burma, but on his previous experience in India.

I think I am correct in saying that the only officers who have been consulted officially with regard to the question of fire-protection have, like the distinguished officer just referred to, come to Burma late in their service, yet on the other hand all Divisional Officers, who after all have had ample opportunities of studying local conditions, are, I believe, without exception, opposed to too much fire-protection.

As I have pointed out, the fact that the question of fire-protection is mainly one of rupees, annas and pies, has always been ignored, but in spite of official apathy, and seeing that a broad hint was given in a Government resolution that any open expression of opinion adverse to protection would be regarded unfavourable. I may add that in spite of official antagonism, reliable statistics have been collected by private enterprise on the more important points. Other minor matters have been freely discussed, and where there appears to be some doubt the earliest opportunity has been taken of verifying the facts by further observations, with the result that there is a great degree of unanimity on all matters having an important bearing on the question. There are many points on which it is desirable to make further observations and experiments, but taking everything into consideration, I am inclined to think that Divisional Officers in Burma could present as reliable and as clear a statement of the profits or loss of fire-protection as their colleagues in any other Province.

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AKYAB :
June 1912.

FOREST FIRES.

In the May 1912 number of the *Indian Forester* Mr. Fischer publishes a most interesting resumé of all the available evidence which has appeared in connection with fire-protection. He most faithfully records the *pros* and *cons* of the position of affairs upon which he has, with the help of his personal experience, drawn certain conclusions.

Carefully as all the points have been considered the writer cannot agree with him when he states on page 221 that "In all forests fire is harmful." He adds in the next clause II, "In certain forests, however, fire protection unaided by other operations hinders the natural reproduction, etc." The above statements no doubt apply to many forests though by no means to all. An attempt will be made to prove this point by giving an example.

In the North Kanara Division of Bombay on the Western Ghats teak forest occurs on the upper slopes which extend over the top of the Ghats some distance inland. Between the upper slopes and extending some 60 miles westward towards the sea there exist moist deciduous and evergreen forests, situated on the spurs and in the valleys of the Western Ghats. The forests here are very fine, consisting of true evergreens on the upper shady slope which pass into semi-evergreens chiefly of *Xylia dolabriformis* and so on into moist deciduous forests, in which a limited amount of teak and many *Terminalias*, *Lagerstræmias*, *Dalbergias*, *Dillenias*, etc., play an important part. Generally along the edges of the river and especially on the by-streams which run up into the Ghats, narrow belts of evergreen are to be found. Now these moist deciduous forests, with the exception of the evergreens, have been successfully protected from fire for more than 30 years. The writer prepared working-plans for some of them, and even without such a thorough inspection as is necessary in order to carry out that work, it is quite apparent that the evergreens are fast encroaching on the moist deciduous forest. Instance after instance can be seen of old well-grown *Terminalia tomentosa* and tall *Lagerstræmia microcarpa*, both very valuable species in that locality, standing far above a dense crop of true and comparatively young evergreen, in which not a deciduous seedling is to be found. This gradual transformation the writer puts down to fire-protection, and to nothing else and for this reason, that though undoubtedly most of the deciduous species suffer more or less from fire especially in the seedling stage, the evergreen species suffer in proportion much more severely. The transition stage is not generally a direct one from the moist deciduous to true evergreen type, but what generally takes place is for the moist deciduous to give place to forests of which over 50 per cent is made up of *Xylia dolabriformis*, in which the evergreens gradually appear and eventually take possession of the soil.

It appears impossible to lay down any general rule in connection with fire-protection for the whole of India, and this is the conclusion arrived at by the writer after having visited forests in

several provinces of India and also in Burma. There are without doubt forests which require strict fire-protection, and there are at the same time forests which require no fire-protection and between these two limits there exist every shade and grade of forest. The difficulty is not in laying down a law either for or against fire-protection, but to draw the line where fire protection should begin and where it should end.

In support of the above argument it is proposed to give a few examples. In the Satpuras, or again in most of the Deccan forests or in the dry areas of Guzerat and Rajputana, where we have dry deciduous teak forests and a crop of still drier high grass, the results of fire-protection are everywhere evident, though it must be admitted that while in many places teak seedlings appear in fair numbers, other species such as *Albizzia*, *Acacia*, *Anogeissus* and *Dalbergia* seem to benefit still more from fire-protection. Another instance of the necessity of fire-protection is afforded by the forests on the north bank of the Brahmaputra in the Lakhimpur Division of Assam, where *Bombax malabaricum* and *Bombax insigne* grow in a way which is seldom found in any other part of India. The timber of these two species is in great demand for tea-boxes, but the supply is now running short, and for the reason that nothing has been done to protect the millions of seedlings which try to get through but which are cut back by the annual fires which take place in these grass lands. Even protection for a period of five years would do much to establish these *Bombax* forests. The above examples are given to illustrate the one extreme. As an example of the other limit, the example of the Kanara forests has been cited, to which may be added the case of most of the Cachar forests in Assam in which a similar process of transformation to that going on in Kanara is taking place, but on somewhat different lines owing to the different conditions of locality and to the diversity of species found in those forests.

Between these two extremes there exist every variety of forests, amongst which may be classed the moist teak forests of Burma. Mr. Fischer maintains that improvement fellings will g far to do that which other foresters claim is partially accomplished

by fires. It is not here intended to go into the question whether it is possible to carry out improvement fellings sufficiently often in order to establish teak regeneration in those forests. The writer is convinced that it cannot be done with the present available establishment. The debatable point is whether fire-protected areas contain a smaller number of seedlings than unprotected areas. The writer only inspected a very limited number of forests in four Divisions of Burma, but from what he saw, especially in the Toungoo and Pyinmana Divisions, he has not the slightest doubt that he saw many times the number of teak seedlings in unprotected forests.

The conclusions therefore arrived at by the writer are that it is extremely doubtful if any fixed rule can be laid down as regards fire-protection in India and Burma, and that to determine whether it is necessary in any given area or not, it is advisable for an officer to approach the subject with an open mind and then after having had at least two or three years' experience in that locality, to decide whether or not fire-protection is necessary.

R. S. PEARSON,
I. F. S.

A NOTE ON THE NATURAL REGENERATION OF PYINKADO IN THE MINHLA AND MOKKA RESERVES OF THE THARRAWADDY FOREST DIVISION.

The Conservator of Forests, Pegu Circle, having noted on my diary for week ending 20th January 1912 that a short account of the Pyinkado regeneration dealt with by me during the seasons 1910-11 and 1911-12 would be of interest I beg to submit the following report :—

1. The original idea was to make an ordinary Improvement Fellings in Compartments 11 and 12 of the Minhla Reserve, to free teak and Pyinkado poles and trees, but finding that the regeneration of Pyinkado was so very good. I decided to make a very heavy felling in order to give it every advantage.

2. Finding the above two Compartments so good, I was led to examine other areas in the vicinity and found that the

following Compartments contained Pyinkado regeneration on a similar scale, *i.e.* :—

Minhla Compartments 10, 11, 12, 15.

Mokka Compartments 30, 31, 32, 33, 34, 35, 41, 42, 51 and 52.

These forests are included in what might be called the Sub-Yoma portions of the Minhla and Mokka Reserves, which consist of undulating country easily accessible to carts, in which the extraction of Pyinkado is possible at a reasonable cost.

3. *Description of the forests.*—These Compartments, with the exception of Mokka 41 and 42 which are moist, may be described generally as dry forest throughout, bamboos being absent over considerable areas, elsewhere Thaikwa (*Bambusa Tulda*) and Myinwa (*Dendrocalamus strictus*) occur.

The following table of figures taken from the working-plans of these forests made for Minhla Reserve in 1887-88 and for Mokka Reserve in 1884-85 will give a very fair idea of the mixture of species in these areas :—

Reserve.	Compartment.	Areas including plantations.	Working-plans estimate of trees 1 foot diameter and over.			
			Teak.	Pyinkado.	Pyinma.	All others.
Minhla ...	10	678	2,289	3,595	960	18,848
	11	430	1,239	1,121	1,046	9,363
	12	548	387	411	183	2,514
	15	559	447	517	112	2,425
Mokka ...	30	304	544	1,636	410	7,083
	31	388	1,239	990	770	12,526
	32	293	759	1,397	994	8,599
	33	235	1,282	1,462	382	9,457
	34	282	1,290	1,635	864	11,607
	35	208	609	728	298	4,521
	41	1,058	2,228	1,433	68	9,342
	42	772	1,118	1,101	203	9,554
	51	251	1,076	700	236	4,436
	52	346	664	759	301	6,153

4. While engaged on Improvement Fellings in Compartments 11 and 12 in 1910-11, the writer found that these Compartments contained a very considerable amount of regeneration of Pyinkado which was fairly well in evidence and badly wanted help by

removal of the overhead cover of inferior species. This regeneration might fitly be termed " Advance growth " in view of the fact that the subsequent felling was so heavy as to amount virtually to a regeneration felling of the Regular Method.

This felling consisted in the removal practically of all trees except Teak, Pyinkado and Pyinma. During season 1911-12 when work was started earlier, these Compartments were thoroughly cleaned and a secondary felling was made, damaged poles being cut back at the same time. All that now remains to be done, to complete what is practically a regeneration felling, is the removal of the Teak, Pyinkado and Pyinma trees left overhead, but, as many of these are not mature, it is not proposed to make the sacrifice merely for the sake of uniformity. All marketable Pyinkado has been marked for felling and will in due course be felled and removed by purchasers.

An abstract of the cost of these operations would perhaps not be out of place :—

	Rs.
Primary Improvement Fellings including Creeper Cutting done in 1910-11 ...	1,631
Secondary Improvement Fellings and Cleanings done in 1911-12	342
Total	1,973

The area of these two Compartments excluding plantations is 662 acres. I estimate that one-fifth of the area consisted of treeless bamboo forest in which nothing was done so that the actual area treated was $662 - \frac{662}{5} = 662 - 132 = 530$ acres.

The cost per acre so far has therefore been Rs. 3-11-6.

5. Moreover, whereas it was noticed that the young Pyinkado was well distributed over the Compartments in areas in which bamboos were absent, in many bamboo areas except along the outer edges where sidelight had penetrated and where clumps had died out after seeding, regeneration was conspicuous by its absence.

6. In some of the untreated bamboo areas the amount of young seedlings was marvellous as the following figures of sample plots counted will show :—

Plot No. 1, area ¼ acre, seedlings found 3,309 or 13,200 per acre.

Plot No. 2, area 1 square chain, seedlings 1,088 or 10,800 per acre.

These two plots have been treated for experimental purposes as follows :—

Plot No. 1—all bamboos were cut down and left lying over the seedlings. Plot No. 2—bamboos were cut and removed outside the area. The plots adjoin each other and have been demarcated with posts and ditches, and it will be interesting to note what the result will be. These plots are typical of a considerable portion of the areas noted in para. 2.

7. Owing to the want of time, before the plants lost their leaves I was able to do very little counting of Sample areas and only managed to count up one other area, and this was a linear survey of 9 chains length covering 1·8 acres counted in Compartment 32, Mokka Reserve, with the following result :—

Seedlings of 1′ height and over	3,691
Poles 8″ to 1′ girth	21
Trees 4′ „ 5′ „	2
„ 5′ „ 6′ „	2
„ over 6′ „	2

This is of extreme interest, as showing the almost complete failure of the advance growth to establish itself in the form of trees, and the vast amount of benefit which must accrue from heavy overhead clearances. This sample plot is typical of the dry tree forest known locally as "Thitkyin," which forms the larger portion of the area mentioned in para. 2.

It must not be presumed that this regeneration is something sudden which has recently appeared, on the contrary, where the cover has been light, all classes of trees are represented clearly showing that it has been there always but has not been noticed in the past.

8. Many of the compartments adjoining the areas under report, which fall within the area, over which Karens have the right to cut Taungyas, contain very considerable quantities of Pyinkado, and large patches of "ponso" (or old clearings) were noticed to be full of young Pyinkado, but it is heart-breaking to know that nothing can be done to prevent the sinful destruction of this valuable timber as there is no law to prevent the Ya cutter from felling anything but teak. The writer was able to make some countings in most of the Taungyas cleared last year and the present year with the result that in 38 years with an area estimated at 190 acres, 226 trees with a girth of from 3′ to 14′ were left standing though the majority were dead or girdled. Judging from the surrounding forests the amount of small trees destroyed must have been quite considerable.

In conclusion, I would beg to add that I am very pleased to see that local firms have been making enquiries recently with a view to establishing a saw-mill in the heart of this Pyinkado bearing area. Some 20 miles of fair-weather cart-roads passing through these areas have been constructed under my supervision during the past two years and this will be a great help in carting out sleepers, but I should dearly like to see more money granted for extensions and improvements of these tracks.

T. W. FORSTER,
Extra Deputy Conservator of Forests,
Tharrawaddy Division.

THARRAWADDY:
5th June 1912.

RESIN TAPPING IN AMERICA.

Copy of a letter No. DZ, dated April 10th, 1912, from Professor B. Sudworth, Dendrologist, U. S., Department of Agriculture, Forest Service, Washington, to the Forest Economist, Dehra Dun.

Your communication of March 7th to the Supervisor of the Choctawhatchee National Forest, Florida, U. S. A., has come to our central office at Washington for attention, and in order that you may be put in touch with the firm which is manufacturing

the turpentine cups referred to in the *Indian Forester*, page 450, August 1910, I shall forward your letter to Mr. I. F. Eldrege, Pensacola, Florida, Supervisor of the Florida National Forest, with the request that he send your letter to the manufacturers of the glass turpentine cup in which you are interested. The Forest Service obtained the few cups it used of this type direct from the manufacturers. It will be most satisfactory, I am sure, for you also to deal directly with the makers, as we have no arrangement with them for distributing their turpentine cups.

Since Mr. Woolsey communicated the article referred to in the *Indian Forester* much has been learnt regarding the practical value of this glass turpentine cup. The Forest Service tried a few of these cups on our native *Pinus heterophylla* and *Pinus ponderosa*. *Pinus heterophylla* yields resin copiously under all methods of tapping, and the results obtained with the glass cups were much more striking than those from all other turpentine pines. Our experiments with the glass cup were not extensive, but sufficient to seem to show that in its present form the cup occasions several practical difficulties and would result, it seems, in injurying the vitality of the tree and the quality of the timber (which we always cut into lumber after the trees have been turpentined). It is doubtful, moreover, whether this cup would permit working the trees for as many years and at the same time give as large a yield of resin as other cup systems we use. So far as our experience goes with our native pines, it is absolutely necessary to recut or scarify the original tap wound once a week in order to maintain a continuous flow of resin. This is not easily accomplished with the glass cup, but easily when any of the cup and gutter systems are employed.

I take pleasure in sending, under another cover, Forest Service publications which fully describe the cup and gutter system we have used, and which is now generally adopted by turpentine operators here.

The improved automatically-controlled turpentine "hack," referred to in a footnote in Bulletin 90, we believe is going to give us the most conservative method of turpentining our pines. This

instrument will permit operators to obtain the largest yield of resin with the minimum injury to the timber.

I am personally convinced that any system of turpentining must of necessity provide for a weekly or bi-weekly slight re-cutting or "chipping" of the original wound in order to stimulate the vigorous flow of resin. The first wound made becomes clogged with resin after a week's "run," the flow of resin then being very light. By taking off a thin "chip," a vigorous flow of resin is again stimulated. Moreover, we find by a microscopic study of the wood of trees that are being turpentined that as this wound extends, new or adventitious resin ducts are formed in the wood above the cut as a result of the continued chipping. These added resin ducts give a greater flow of resin than comes from the first tapping.

The inventor of the glass cup seems not to have appreciated the necessity, as it seems to me, of periodic "chipping." His idea was probably that sealing up of the original tap wound (hole), from which the resin is to flow, would ensure a continued flow. So far as I can see this, however, does not take place in practice, for finally the flow of resin becomes less and less. As already stated, the very best results with this cup were obtained in our *P. heterophylla* because this tree does not, as do other turpentine pines, form "scrape" or thickened "gum," even when the wound is exposed to the air, the resin flowing longer without re-chipping. Applied, however, to our principal turpentine pine, *Pinus palustris*, the amount of resin obtainable with this glass cup is very much less and because this tree requires re-cutting at frequent intervals to ensure a continued flow.

THE DIFFERENT FORMS OF PYINKADO.

1. In a note published in the *Indian Forester*, Vol. XXXVII, p. 178, Dr. Percy Groom, pointing out that there were recognisable differences in the structure of the wood believed to belong to *Xylia dolabriformis*, Benth., supplied by the Forest Economist, and which had been collected in Burma and Bombay respectively, raised the

question as to whether these specimens really belonged to the same botanical species. Item 7, Part II, of the Programme of Work prescribed for the Forest Botanist during the period 1910—13 reads as follows :—

"Detailed systematic study and description of all forms of forest plants of economic value, when such is required owing to the commercial importance of the species and to the fact that the existing classification and descriptions are unsatisfactory and confusing." The Forest Botanist accordingly took up the question and in his office circular No. 261/3, dated 5th May 1911 addressed a request to the Chief Conservators of Forests, Burma and Central Provinces, and the Conservators of Madras and Bombay, for any help which it might be possible to afford him in the way of supplying good and complete specimens from all districts where *Xylia* was known to occur. This circular pointed out that the specimens should include "botanical specimens as complete as circumstances permit of leaves, flowers and fruit, great care being taken to clearly number all specimens taken from one and the same individual tree in the same way. Notes should also be given as to the characters (if any) which in the forest are found to distinguish one form from another. The trees from which the specimens are obtained should be numbered in the forest, so that they can be traced subsequently. When all the material submitted has been examined and classified, a few typical trees will be selected by the Botanist and their numbers notified to the local officers for felling, so that representative timber specimens may be obtained for microscopic examination and for testing by the Forest Economist."

In response to this request several Forest Officers have very kindly sent in sets of specimens and the present note is based on a preliminary examination of this material.

2. An important character in the genus *Xylia* is the existence of a gland at the apex of the anther and as this gland is deciduous he character can best be determined in the flower-bud It is a remarkable fact that all the specimens as yet seen by the writer from Burma (from Mu, Katha, Meiktila, Pyinmana, Minbu, Toungoo, Zigôn, Henzada and Ataran Divisions), in which the character

could be satisfactorily determined, show *no glands* on the anthers. On the other hand, all the specimens seen from India (from North Thana and North Kanara in Bombay, from S. Malabar in Madras, and from Balaghat, Bhandara and N. Chanda in the Central Provinces) show a large and perfectly distinct stipitate gland on the anthers. Thus, so far as this character is concerned, there appears to be a real difference between the Burmese pyinkado and the tree of the Indian Peninsula. It is also remarkable that Kurz, when describing the Burmese pyinkado in his *Forest Flora*, Vol. I, p. 419, states that the anthers are *without glands*. Further, it must be noted that Bentham appears to have founded his species *Xylia dolabriformis* on specimens with eglandular anthers and in Hooker's Journal. Bot., IV, 417 (1842) and in the *Genera Plantarum*, I, p. 436 (1865) the anthers are described as eglandular If further study, therefore, proves, as at present it appears probable that it will, that other characters are correlated with that of the gland and that the two trees really are distinct, it seems that the Burmese pyinkado should stand as *Xylia dolabriformis*, Benth., while the tree of the Indian Peninsula would be *Xylia xylocarpa* (Roxb.) = (*Mimosa xylocarpa*, Roxb., in *Cor. Pl.* p. 68 (1795).) In Kew Bulletin, 1909, p. 357, Craib and Hutchinson describe the species *Xylia Kerrii*, based on Kerr's No. 547 from Siam, and which they state differs from *Xylia dolabriformis*, Benth., in having eglandular anthers and the mature leaves pilose below.

Xylia Kerrii, Craib and Hutchinson, was also described in *Hooker's Icones*, *t.* 2932 (1911) and Lace's No. 2780 from Tharrawaddy (of which Mr. Lace has very kindly presented a sheet to the Dehra Herb.) was then included in the species, thus extending its area of distribution to Burma.

Specimens recently received at Dehra Dun, however, have shown that the mature leaves of trees with eglandular anthers may vary from glabrous to densely pubescent or hirtellous below and that the hairiness of the mature leaves does not therefore always separate the eglandular from the glandular forms.

The hairiness below of the mature leaves in the Burmese tree, moreover, from the specimens received to date, appears to be a

character of little, or at most of only varietal, importance. The hairiness in some cases varies considerably on the same tree, while numerous intermediates unite the glabrous with the densely hairy forms. The former seem to prevail in œcologically moist localities (*e.g.*, South Henzada, Moulmein and Katha), while the latter are found in relatively xerophytic habitat (*e.g.*, Zigôn, the *hills* of North Henzada and the *ridges* of Toungoo). It is hoped that local officers may be able to supply further information regarding this point.

2. There is, however, no doubt that the Burmese pyinkado is a very variable tree, and the following interesting note drawn up by Mr. C. W. Allan, Extra Deputy Conservator of Forests, Henzada Division, on three forms which are locally distinguished, has recently been received by the writer through the kindness of Mr. J. H. Lace :—

"The three kinds of Pyinkado :

(1) *Pyinkado-wa* or *yellow pyinkado.*

(2) *Pyinkado-ni* or *red pyinkado.*

(3) *Pyinkado-net* or *black pyinkado.*

(1) The *Pyinkado-wa* or *yellow variety.*—In this variety the heart-wood is of a yellowish-brown colour, hence the name. The leaves and seed pods are longer than in the other two varieties. The flower is also larger. It is found away from the hills, chiefly where the soil is moist. The tree splits in felling and the timber cracks and warps very considerably after sawing. The fibre on the longitudinal section is not so wavy as in the other two kinds. The Burmans do not fancy it for building purposes and will not use it where either of the other two kinds can be had. The wood is not hard.

(2) The *Pyinkado-ni* or *red variety.*—In this variety the heartwood is of a reddish-brown colour. The leaves, flowers and seed pods are smaller on laterite soil and "Indaing." The tree does not split on felling and the wood does not warp or crack very much after being converted. The fibre on the longitudinal section is wavy. It is heavier than (1) but lighter than (3). The Burmans like it for building purposes. Wood is moderately hard.

(3) The *Pyinkado-net* or *black variety*.—In this variety the heart-wood is of a very dark-brown colour and is extremely hard. The leaves, flowers and seed pods are very much smaller than in either of the other kinds. It is found chiefly in the hills, also in "Indaing" with a laterite soil. The tree does not split in felling and the timber does not warp or crack very much after conversion. The fibre on the longitudinal section is wavy. It is heavier than the other kinds and is considered the very best for building purposes The botanical specimens received from Henzàda show (1) a form with mature leaves strongly hirtellous mainly on midrib and lateral nerves below, (2) a form with mature leaves densely pubescent below, and (3) a form with mature leaves glabrous below, but unfortunately the notes sent do not describe the timber of these forms.* In Pyinmana two forms, as follows, are reported to be locally distinguished :—

Red pyinkado :—leaves large, bark red, rough, heart-wood large, comparatively easy to saw.

White pyinkado :—leaves small, bark white, smoothish, heartwood smaller but harder and not so easy to saw.

From the specimens sent in, the leaves in both these forms are, apart from size, very similar and are more or less pubescent below, especially on the nerves. Further specimens have been asked for in the hope of finding some additional definite morphological characters which can be correlated with the above. There is believed to be no difference in the *colour* of the timber of these two forms.

It is probable that further enquiry will bring to light considerable variation also in the Indian tree.

4. For the correct definition and co-ordination of the recognisable forms, however, considerable further study is required involving, among other things, a study of the 7 odd species

* Further specimens, received since the above was sent to Press, have shown that there is practically no difference, as regards the hairiness of the mature leaves, between the *yellow*, *red* and *black* forms, while in one and the same form the mature leaves vary from practically glabrous to densely pubescent below.

belonging to the genus which have been described from Africa and Madagascar and an examination of more complete material than is yet available at Dehra Dun. The object of this note, therefore, is not to publish final conclusions, but to (1) draw attention to the interesting and important character of this enquiry; (2) heartily thank those Forest Officers who have very kindly contributed specimens up to date, and especially Mr. J. H. Lace, Chief Conservator of Burma, Mr. F. A. Leete of Pyinmana Division, Mr. C. B. Smales of Zigôn Division, Mr. H. R. Blanford of Katha Division and Mr. F. Ryan of Meiktila Division, all of whom have contributed splendid sets of specimens; (3) ask for the continued co-operation of all Forest Officers in *Xylia*-producing districts in obtaining the specimens and information which are still required in order to complete this work; and (4) point out the urgent need of good specimens from Madras, Bombay and the Central Provinces to supplement the material received from Burma, the specimens of the Indian tree at present available being very meagre.

5. In anticipation of such co-operation attention is drawn to the following points:—

(*a*) It is particularly requested that no trouble be taken to *mount* the specimens submitted. From a few districts mounted specimens have been sent in which have usually been reduced to comparatively valueless scraps in the effort to make the specimens fit neatly on the mounting-paper, while the fact that such specimens are gummed to the paper interferes with their satisfactory examination.

(*b*) The following are now particularly desired:—

Several good flowering twigs, *several* twigs with good specimens of mature leaves (indicating especially differences of size, shape, texture and hairiness) and *several* ripe fruits from *each selected individual tree* in all districts where these specimens have not yet been collected. Such specimens will give a good idea of *individual* variation in flower, leaf and fruit

which is indispensable for a sound description and classification of the various forms.

(*c*) It is desirable, as far as possible, to correlate the ordinary botanical characters with the characters of the wood, and notes should therefore be sent with all specimens, indicating any differences locally recognised in the quality of the wood of the various selected trees. Notes should also be given regarding the class of forest and type of locality in which the different forms are usually found.

(*d*) As the glands on the anthers are best seen in the bud, the flowering twigs should include some immature heads in which the flowers have not yet opened.

As fallen flowers are usually more or less damaged by insects they should only be sent when no others are obtainable.

R. S. HOLE.

5th July 1912.

PROVINCIAL FOREST SCHOOL, U. P.

FINAL EXAMINATIONS, 1912.

The Final Examinations were held from 21st to 29th June 1912 at Naini Tal. The Board of Examiners was presided over by Messrs. Osmaston and Clutterbuck, Conservators of Forests. All the 24 students examined succeeded in obtaining certificates, seven getting Honour's marks (*i.e.*, above 75 per cent.)

Of these 24, three were from Kashmir, one from Ajmer, one a private student, the remainder belonging to the Province.

Two medals were offered by the Government of the United Provinces and one prize by the Officer in charge of the School for competition among the students ; and these were awarded as follows :—

1 A medal for the "Best student of the year" to Manzur Husain, Deputy Ranger, Eastern Circle, who headed the list.

2. "Forestry medal" to Jai Kishan, Export Clerk, Western Circle, who obtained the highest marks in Forestry.
3. Prize for Merit to Hari Chand, Forester, Kashmir State, for general aptitude.

Certificates and prizes were distributed by Mr. Osmaston on the 1st July in presence of a meeting consisting of the members of the Board of Examiners and the School Officers, after which a short instructive speech in Urdu was delivered to the out-going students regarding their future works in forests.

CORRESPONDENCE.

TO THE HONORARY EDITOR, INDIAN FORESTER.

A SUGGESTION FOR THE COLLECTION AND PRESERVATION OF THE LATE SIR D. BRANDIS' LETTERS IN THE FOREST MUSEUM AT OXFORD.

SIR,—I have recently handed over charge of a Division in Burma in the office of which lie original letters by the late Sir Dietrich Brandis and Sir William Schlich relating to some of the earliest work carried out by the Forest Department—the struggles of its earliest infancy.

There must be many more such records in other Divisions in the districts which formed the original Province of Pegu or British Burma as it was called then.

These records are mostly on hand-made paper and bound up in calf, but are sadly the worse for years of wear and neglect. They were unearthed by me when I rearranged the whole of the office records on the occasion of a change of office buildings some months ago. From the manner in which I found them mixed up with other papers I fancy that more than one Divisional Officer may have been a long time in the Division, as I was, without knowing of their existence.

The records have but little real use as far as the need for official reference is concerned; all the information they contain

has long since been incorporated in printed forms and reports. It seems, therefore, a pity that some more fitting resting place should not be found for them than the inevitable neglect of an ordinary Divisional Office.

Might I therefore suggest that the whole of these letters, which have a great historical interest for the Department, might be collected from the various Divisional Offices in which they now lie and suitably preserved at Oxford in the Forest Museum there.

G. R. JEFFERY.

6th June 1912.

OUTFIT FOR OFFICERS ON FIRST JOINING THE I.F.S.

SIR,—I am frequently asked for advice as to what the young Forest Officer, about to proceed to India, requires in the way of an outfit. Mr. Carter, Conservator of Forests, Assam, recently drew up and sent me for distribution to the probationers proceeding to Burma a list, which with certain additions and alterations, for which Mr. Jackson, lately Conservator of Forests, U. P., and myself are responsible, I would now submit to the criticism of your readers.

A. M. CACCIA.

19, *Linton Road, Oxford.*

SUGGESTED OUTFIT FOR OFFICERS JOINING THE INDIAN FOREST SERVICE.

In the following list are entered only such articles as are considered to be absolutely necessary. Total estimated cost, excluding clothing, about £23.

The articles marked with an asterisk (*) can be obtained in England or equally well, if not better and more conveniently, at port of debarkation in India.

Owing to the facility with which articles can be sent from England to India through the parcel post, owing to the large number of excellent shops in India (*e.g.*, the various branches of The Army and Navy Stores of 105, Victoria Street, London, in Bombay, Calcutta, Madras and Rangoon; Whiteaway, Laidlaw and Co., &c., &c.), and owing to the danger of deterioration in

India, it is not advisable to take out large stocks of clothes, linen, etc., that is, over and above what is actually required for use.

I.—CLOTHES.

Ordinary light clothes of the lightest summer cloths.

Evening dress and a blue suit are indispensable. Also flannels for tennis, etc. In addition it is advisable to take out all other clothes in possession, *including great coats.*

A good fitting Norfolk coat is particularly useful as a pattern for native tailors, who will make khaki or jungle cloth suits. A pair of riding breeches and leggings are also useful

Under-linen and under-clothing as in England for summer wear, including white evening dress shirts, soft shirts, and flannel shirts.

Boots, thick and thin, as for country wear in England.

* *Topi* (Pith helmet) may be bought at Port Said or at port of arrival in India.

II.—LINEN.

A.—Table Linen :—

18s.	3	Table Cloths (kitchen quality will do), say 6′ × 6′
5s.	6	Table Napkins.

B.—House Linen :—

30s.	3	Pairs twill sheets.
10s.	6	Pillow cases.
10s.	4	Bath towels.
9s.	6	Face towels.
3s.	1	Dozen dusters.
5s.	1	Dozen glass cloths.
4s.	1	Dozen kitchen cloths.

III.—BEDDING.

30s.	* 3	Good (coloured) Blankets or Rugs.
8s.	* 1	Rezai (native quilt).

50s.	*	1	Major Elliot's pattern, (or Improved Charpoy Bedstead). Folding Camp bed.	To be purchased at Army and Navy Stores, London, Bombay, Rangoon, Madras or Calcutta, or, at T. P. Luscombe & Co., Allahabad, India.
30s.	*	1	Mattress for Folding Camp bed.	
7s.	*	2	Large pillows for Folding Camp bed.	
10s.	*	1	Mosquito net for Folding Camp bed.	
20s.	*	1	Willesden canvas ground sheet 9′ × 9′ with strong straps for same.	

IV.—FURNITURE.

7s.		1	Deck Chair as required for boardship.	
3s.	*	1	Large enamelled-iron washing basin.	

V.—KITCHEN.

40s.	*	1	Nest (5) aluminium cooking utensils.	Aluminium indispensable to avoid poisoning, etc.
2s.	*	1	Frying pan, aluminium.	
8s.	*	1	Kettle.	
1s.	*	2	Kitchen spoons.	
1s.	*	2	Kitchen forks.	
2s.	*	2	Kitchen knives.	
4s.	*	1	Japanned tray.	
2s.	*	3	White enamelled plates,	

VI.—CHINA, GLASS AND CUTLERY.

1s.	*	3	Common peg tumblers.	These articles may be bought at any headquarters station in India.
2s.	*	3	White kitchen China Soup plates.	
2s.	*	3	White kitchen China Meat plates.	
2s.	*	3	White kitchen China Pudding plates.	

1s.	*	3	White kitchen China Cheese plates.
2s.	*	3	White kitchen China Cups and Saucers.
1s.	*	1	Brown teapot.
1s.	*	1	Big Milk jug.
1s.	*	1	Small Milk jug.
2s.	*	2	Enamel Pie dishes.
3s.	*	2	„ Vegetable dishes.
2s.	*	2	„ Meat dishes.
4s.		6	small knives.
6s.		6	„ electro spoons.
4s.		6	„ „ tea spoons.
6s.		6	„ „ forks.
6s.		4	„ „ table spoons.
5s.		1	pair carvers.

These articles may be bought at any headquarters station in India.

VII.—SUNDRIES.

25s. 1 Travelling Bath tub with lid and inside basket.

[Can be used as a trunk on journey out. May be obtained at Army and Navy Stores.]

Take all trunks and boxes in possession, also--

50s. 1 Cabin trunk (canvas) for cabin use on boardship.
5s. 1 Soiled-linen canvas bag with padlock for boardship.
1s. 1 Nickel travelling soap box and soap.
5s. * 1 Parafin table lamp.

[The best lamp for camp use is a special all metal lamp, which unscrews for packing and travels in small tin case, cost 15s. at Army and Navy Stores, Bombay.]

6s. * 2 Hurricane lanterns, Hink's.

VIII.—SUGGESTIONS FOR PRESENTS.

12-bore shot gun in case. (Most necessary for a forest officer.)
Saddle and bridle (pony size).
Canteen of glass, £3 at Army and Navy Stores.
Canteen of knives and forks and spoons.

Canteen of China (plates, cups, &c.), fitted for 3 or 6 persons, may be obtained at Whiteaway, Laidlaw & Co., India.

Pair field glasses (Zeiss).

Thermos flask.

Travelling clock.

Despatch box.

Double-barrelled rifle, 400 high velocity: but the most suitable kind of rifle depends a great deal on the Province, and it is advisable therefore not to buy one until Province is settled. Second-hand rifles can be obtained in India.

2 Roorkee pattern folding chairs: 21s. 6d. each at Army and Navy Stores.

Photographic camera.

FUEL SUPPLY TO HILL STATIONS.

SIR,—I have found among my records a note written by Mr. Gamble in 1885 describing the current practice of supplying fuel in Simla and Darjeeling. The note was written for the information of the Madras Government in connection with the arrangements to be made for the supply of fuel at Ootacamund. As a comparison of the present state of affairs with that existing over thirty years ago may be of interest to Forest Officers of to-day. I give below a copy of the note.

Copy of the portion of Mr. Gamble's Note dealing with Northern India.

Simla is a small piece of purchased territory in the midst of small native hill states. It is itself a forest, one portion being covered with deodar, another with oak, another with long-leaved pine and others with mixed trees. But outside it it may be said that scarcely a vestige of forest remains, except the slopes of Mahasu and Mashobra, mostly either private estates or forming parts of the area purchased from the Kuental Raja for the catchment area of the water supply. The fuel supply is chiefly derived from the sale by villagers of bundles of wood brought in from their villages and

consisting of small pieces, roots, etc., of Thododendron, barbeny and other common forest scrub growth. The bundles brought in sell from 6 to 8 annas per about ½ maund (40 lbs.*). The forests of Simla itself belong to the Municipality and are, I believe, worked by it under a working-plan drawn up in (I think) 1875 by Messrs. Hill and Vincent. The want of fuel has now become so pressing that Government, besides arranging to work the Mahaon water catchment area, are in treaty with the Raja of Kuental for the lease from him of the long hillside between Mahasu and Fagu,† which it is intended to replant. Firewood therefore costs in Simla at say 6 annas per 40 lbs., Rs. 9-6 per 1,000 lbs. The supply of charcoal comes from the forests of the Sutlej valley in the native states of Patiala and Bhajji chiefly, and the charcoal is almost as expensive as firewood. Thus in Simla, owing to its geographical position, the fuel supply is entirely (or almost entirely if we consider what is being done by Government and the Municipality) dependent on petty sales by the villagers of the surrounding country.

The fuel supply of Mussoorie is managed pretty much in the same fashion for, like Simla, Mussoorie lies in the native state of Garhwal. I believe Government are talking of taking steps to remedy the want which is almost as much felt as at Simla. The *Chakrata* supply is nearly all, is possibly all, furnished from the Government forests of the Deoban range, and *I think* it is, as here, sold retail, in the same way as it was when the Preliminary working-plan of the Deoban forests was drawn up by Dr. Brandis in 1875. It was then sold from depôt by Government at 4 annas per maund of 80 lbs. equivalent to Rs. 3-2 per 1,000 lbs. So too the supply of *Murree* and Dalhousie is furnished from the Government forests, but I believe from sales inside them to contractors who retail to the public. At *Naini Tal* the Department also manages forests for the supply of the station but does not usually,

* I give this from memory, but rates may have changed much since I was last in Simla in 1878.

† This was once a splendid forest of silver fir and spruce, the last vestiges of which I saw in 1876.

I think, sell retail but by permits issued from the Forest Divisional Office. The supply of *Darjeeling* which nearly all comes from Government forests has gone through many changes. Previous to 1876, all sales were on permits obtained from the Range Officer which at Rs. 3 per month allowed the removal of one load daily. Darjeeling coolies easily carry one (and often even two) maunds of 80 lbs. so that if, say, only 30 maunds were taken monthly for Rs. 3 the Government revenue came to Rs. 1-4 per 1,000 lbs. for wood standing in the forests. In 1877 this system was altered to sale from depôt at a central spot in the station and this system of sale went on until 1882 at first successfully, afterwards rather badly. The rates of sale were 4 annas per maund equivalent to Rs. 3-2 per 1,000 lbs. at the depôt, retail. The cost of carriage to houses raised this to from Rs. 3-4 to Rs. 3-8.

In 1882, at the suggestion of Dr. Schlich and myself a working-plan was put in force and the yearly cuttings sold in the forest. The system was this: the trees which were to be felled were marked in compartments and tenders were then called for by compartments, the intention being that contractors should purchase and take into the town and sell retail. At the same time as a guarantee against a combination on the part of dealers to unduly raise prices, Government arranged to maintain a store of about 30,000 maunds in depôt permanently, ready for sale should occasion arise. The plan of sale of standing timber has not been a success and I believe it has lately had to be altered to departmental cuttings and sales in the forest by auction, or to allowing purchasers to cut and remove marked timber at a fixed rate.

Thus, it will be seen that nowhere, except perhaps at Chakrata, which is more of a military station than a town of general residence, is fuel now sold retail in the town by Government.

F. A. L.

PROGRESS OF FORESTRY IN GREAT BRITAIN.

The Universities of Oxford and Cambridge have received the following communication from the Board of Agriculture and Fisheries, London :—

BOARD OF AGRICULTURE AND FISHERIES,
4, WHITEHALL PLACE,
LONDON, S.W.
25th March 1912.

SIR,

I am directed by the Board of Agriculture and Fisheries to send to you, for the information of the Universities of Oxford and Cambridge, copies of a memorandum giving particulars of a grant made to the Board by the Treasury on the recommendation of the Development Commissioners for the purpose of enabling certain Institutions in England and Wales to supply technical advice in forestry to landowners and other persons interested, and I am to inquire whether the University would be prepared to undertake the provision of work of this character on the lines indicated in the memorandum, and in accordance with the conditions set forth therein.

If the University is prepared to accept this proposal, I am to say that the Board will be willing to make a grant not exceeding £500 *per annum* for three years from the 1st October next to *provide for the salary and travelling expenses of an advisory expert.* The grant will be subject to the *proviso* that *the total expenditure of the University for this purpose*, less any receipts from fees or other sources, *is greater than the amount of the proposed grant*, and it will be necessary that a certified statement of income and expenditure in connection with the work for the twelve months ending September 30th, should be furnished annually to the Board, together with the necessary vouchers for payments. Payment will be made as soon as possible after the receipt of this statement, but, if necessary, a payment on account would be made in the course of the year.

* * * * * *

The Board will be glad, however, to be furnished with your views on the suitability of the area suggested.

I am, Sir,
Your obedient servant,
T. H. ELLIOTT.

(1) Oxford; (2) Cambridge; (3) Gremester Agricultural College; (4) Bangor; and (5) Armstrong College.

THE MEMORANDUM ABOVE REFERRED TO.

Grant from the Development Fund in respect of Provision of Technical Advice in Forestry.

Owing to inadequate resources, Institutions possessing Forestry Departments have hitherto restricted their attention for the most part to imparting instruction to students. It is now proposed to attach an experienced forest expert to the Forestry Departments of two Universities and three Colleges, whose chief duty will be to supply to landowners and others advice as to the general and detailed working of their woods. Each Institution will, therefore, become for a given district, a centre for information, to which application may be made on all questions relating to the formation, treatment, utilization, and protection of woods.

It is essential that the staff to be employed in advisory work should command the confidence of landowners. The men selected should, therefore, be well acquainted with the practice and theory of forestry both at home and abroad. They should be prepared to study in detail the local conditions in their districts, and they must endeavour to impress the advantages of systematic management on those owners of woodlands with whom they come in contact.

In order to provide the data which are necessary for the foundation of efficient forest management the Board propose, with the co-operation of landowners, to establish a number of experimental plots dealing with the thinning, underplanting, and regeneration of woods. It will be one of the duties of the forest experts to be appointed by means of the Grant to aid the Board's

officers in the selection, treatment, and supervision of these plots, and in the collection of such statistics as may, from time to time, be required.

Conditions of Grant.

1. A grant of £500 per annum for three years from 1st October 1912 will be made to each of five Institutions to provide the salary and travelling expenses of an advisory expert.

2. The grant in each case will be a grant-in-aid only. It must be used for the purpose of developing advisory work, and must not be used for the purpose of reducing existing expenditure.

3. It will be open to an Institution to employ a member of the present staff on advisory work, but in that case his place must be filled by a fresh appointment to the teaching staff.

4. The Board will require to be satisfied that the officers whom it is proposed to employ on advisory work possess the necessary qualifications. Where advice of minor importance is sought the case may be investigated by a junior officer, but in all cases the advisory officer must be responsible for the advice tendered.

5. Advisory officers may undertake a limited amount of teaching on condition that other members of the staff give an approximately equivalent time to advisory work.

6. The advisory staff will be expected to co-operate with the Board's officers both in experimental work and in the making of enquiries.

7. Each Institution in receipt of a grant from this fund will be expected to undertake the advisory work in a group of counties.

8. An Institution may, where this course appears to be desirable, charge a fee in respect of advice tendered under the scheme. The charge may not exceed one guinea per day for each day's work in the field.

9. The advisory officer must supply to the Board a duplicate copy of the reports sent to persons seeking advice, or where verbal advice only is given a short statement of the case and of the advice given should be sent.

Both the Universities of Oxford and Cambridge have decided to accept the offer made by the Board of Agriculture. The University of Oxford too decided to appoint an expert with a salary of £400 per annum, whilst in the case of the University of Cambridge the salary of the advisory expert be fixed at £300. This would leave £100 in the one case and £200 a year in the other case towards the travelling expenses entailed by the advisory work in the counties mentioned above, which the Committee recognise to be a suitable area.

Oxford and Cambridge are now advertising for experts.

HOT WEATHER SAING SHOOTING IN UPPER BURMA.

(*Bos Sondaicus*, Burmese vernacular Saing, peculiar to Burma and Malay Peninsula.)

For those not prepared to face insect pests and the usual discomforts of a rain trip, perhaps the best time, for securing a Saing head, is during the hot season. For a forest officer, moreover, it is often the only time, provided always his fire-protection and other inspection works allow of a few days' halt near Saing country. Saing country *par excellence* is dry open forest of 'in' (*Dipterocarpus tuberculatus*) known throughout the country as 'indaing,' in which large patches of grass (kwins) are interspersed. At the end of March or early in April, both the 'indaing' and the 'kwins,' unless fire-protected, are usually burnt and in some cases buffalo graziers fire the 'kwins' earlier in order to procure good grazing for their herds. The young grass which springs up thickly over the fired 'kwins' proves irresistible to the Saing and when it has reached a height of six inches to a foot one may be tolerably certain of finding these animals grazing at sunrise and sunset. In failing light however accuracy in shooting cannot be depended upon and in addition a wounded beast cannot be tracked down and quickly despatched; so that it is fairly obvious that an early morning start is indicated. Conditions of course vary considerably in different localities and I propose attempting to describe now a successful morning that recently

fell to my lot whilst touring in the division in my charge. My 'lugale' (bearer I think he is called in India) reluctantly woke me at 3 A.M. and after 'chota hazri,' or to be more accurate, a good solid breakfast, I left the camp preceded by a man with a hurricane lantern and followed by my tracker and a man carrying a spare rifle. After a tramp of 3 miles along a very ill-defined foot-path it became light enough to send the lantern bearer back and we found ourselves on the edge of a small 'kwin.' Except for a solitary pig that walked off slowly as we skirted the edge of the 'kwin' no animals were to be seen. Cutting across a patch of jungle to the next 'kwin' another blank was drawn and before striking any fresh tracks I must have scanned round at least a dozen 'kwins.' However, at about 8 A.M. we reached one in which the herd had evidently been grazing that morning and following the tracks we were taken off into a patch of jungle that had not been burnt. The dry 'in' leaves completely covered the ground and it was hopeless for even the best of trackers to continue as there was little or no dew and the herd had traversed the patch more than once during the previous few days. The tracker said he knew to which 'kwin' the herd had moved off and accordingly we went for about a mile further and came up to a herd of domestic buffaloes grazing inside a burnt patch of jungle. Approaching these we saw the Saing herd on the far side standing still, preparatory to taking a siesta. When within 200 yards of the Saing, the buffaloes still intervening, two or three of the herd had lain down, and we also had to do the same as the buffaloes had seen me and in their usual inquisitive if not aggressive manner were making towards me. It seemed likely they would come nearer and then rush off and alarm the Saing, but lying low my tracker judiciously aimed a few small lumps of earth at the nearest and made them sheer slowly off. As soon as the buffaloes had allowed a clear approach a 'gyi' (barking deer) passed just in front but fortunately did not see us.

By crawling on hands and knees over hard but level ground for about 80 yards and squirming full length along the ground for another 20 I got to within 100 yards of the bull who was lying

down. As is invariably the case with a herd at rest, however, a cow was standing near by on the *qui vive* and she got restive. The bull then stood up, saw me but didn't quite know what to make of it and started to trot towards me. I then got a shot but he turned and went off at a good pace permitting a raking shot with my second barrel. He dropped stone dead about sixty yards further on and when I got up I found the first bullet (·450 solid nickel high velocity cordite), had entered the left centre of the chest, gone right through the body and grazed the inside of the left thigh on coming out. The head was only a moderate one, but the tips of the horns were not frayed off as is so often the case with old bulls.

I was back in camp soon after 10 A.M., and by noon not a vestige of the carcase remained in the forest, what my own camp followers had not torn into shreds and hung up to dry in the sun being quickly disposed of by the otherwise vegetarian villagers.

Blank days are not infrequent especially in country that has a reputation for holding big game. On one occasion I had the good fortune to find an old grey bull, cow and calf grazing in an open 'kwin' soon after 5 o'clock in the morning. Stalking to within range occupied about ten minutes after which, just as I was about to take aim, a barking deer I had not seen sprang up and barking for all he was worth gave the alarm to the Saing who were off immediately. We tracked them for four hours but never got another glimpse, and I returned to camp well after noon none too pleased with my luck as the bull appeared to have as fine a head as I have seen. On other occasions nothing has been seen at all though once I came up with a herd of seven cows and two calves without a bull of any size among them. This, perhaps, was not strange since I know that no fewer than eight bulls fell to one gun in this neighbourhood last season. There is unfortunately no limit to the number of head that one person may shoot in a season in Burma—a state of affairs which in the writer's humble opinion should be allowed to continue no longer.

J. D. C.

FOREST ECONOMIC PRODUCTS IN THE U. S. A.

We print below an extract from "The World's Paper Trade Review," which indicates the progress made by the United States Forestry Department in their endeavours to utilise their forest products.

It is evident on their economic products laboratory alone large sums of money must have been expended. What has been and is being done in India compares unfavourably with American methods, here we are much hampered for want of buildings, money and men, while the United States rightly holds that a liberal expenditure will yield large commercial returns in the future and is thus amply justified. The Forest Department in India would be well pleased if American methods could to a larger extent be introduced here:—

"In a report presented to the Forestry Committee of the University of Cambridge, Mr. E. R. Burdon, M.A., gives an account of a visit to the United States and Canada for the purpose of studying the research work and educational methods of the forestry departments and forestry schools in connection with the study of timber and other forest products. The report states that the main object of the Products Branch of the United States Forest Service is to develop more economical methods of utilising forest products generally, so as to eliminate the enormous waste which occurs not only in logging, but also in conversion into lumber and in manufacture. The report says, 'the range of the Products Branch covers every industry which is in any way dependent on the forest for its raw material. The work is thus of the greatest economic value, and the results already obtained are doing more than almost any other agency to educate the timber trade at large to a proper appreciation of scientific forestry.' The Products Laboratory is organised into eight technical sections for experimental research, and one non-technical section which attends to general maintenance. The technical sections are as follows:—(1) timber testing, (2) timber physics, (3) wood preservation, (4) wood distillation, (5) pulp and paper, (6) engineering (with drafting room), (7) chemistry, (8) pathology.

The work of the pulp and paper department is mainly directed at present to the discovery of woods which can be substituted for spruce as a source of pulp in view of the rapid disappearance of the spruce forests. This involves studies of the methods by which ground wood-pulp can be obtained from species other than spruce; of the potentialities of different woods in the manufacture of chemical pulp; of the qualities of paper which can be made from various grades of sulphite, soda and ground wood-pulp; and of the possibilities of utilising various forms of forest and mill waste for the manufacture of pulp. A miniature pulp and paper mill has been installed, consisting of two thirty-pound digesters, one for soda, the other for sulphite pulp, an acid-making system, the necessary grinders, beaters and screens, and a Fourdrinier paper machine capable of making a roll of paper fifteen inches wide. In addition a branch laboratory, for which Congress gave a special appropriation of $30,000, has been set up at Wausau, for the separate study of making ground wood-pulp from woods other than spruce. This laboratory is equipped with a commercial grinding plant which is specially designed to allow of the speed of the grinder being varied through wide limits. The work of both laboratories is carried on in closest co-operation with the paper manufacturers of Wisconsin and with the American Paper and Pulp Association. Meetings are held at frequent intervals, and samples of pulp and paper made in the laboratory are submitted for examination, and the methods of preparation explained and discussed. If required, the laboratory is ready to prepare pulp by any method in sufficient quantity for the manufacturer to test it on a commercial scale."

AGAR-AGAR AS VEHICLE FOR INTESTINAL MEDICATION.

Agar-agar in the dry state passes through the stomach undigested, and on reaching the bowel takes up water and swells considerably, thereby increasing the volume of the evacuations. This property is made use of to increase the aperient action of cascara in the preparation "Regulin." Agar-agar is a valuable

agent not only in cases of constipation, but also in other conditions of the bowel, because it gives up any medicament with which it may be combined very slowly by osmosis and only after the administration of water. Various drugs may be incorporated with agar in the following manner : The drug is well mixed with an aqueous solution of agar and the whole evaporated down to the original volume of the dry agar. The residue is then coarsely powdered. The following preparations have been used with success by the author—a measured teaspoonful (about 1 gramme) contains the quantity of medicament stated in each case :—(1) Phenolphthalein-agar—0·03 gramme phenolphthalein. (2) Rhubarb-agar—1 mil Ext. Fl. Rhei, U. S. P. (3) Calumba-agar—2 mils Ext. Fl. Calumbæ, U. S. P. (4) Gambir-agar—2 mils Tr. Gambir Co., U. S. P. (5) Tannin-agar—0·03 gramme tannin. (6) Simaruba-agar,—1 mil Tr. Simarub. U. S. P. (8) Ipecacuanha-agar—1 mil Tr. Ipecac, U. S. P. (9) Sumbul-agar—1 mil Ext. Fl. Sumbul, U. S. P.—M. Einhorn (*Berl. Klin. Wochenschr*, 1912, 3 ; *Pharm. Zeit.*, 1912, 18, 177).—[*The Pharmaceutical Journal and Pharmacist.*]

[Agar-agar is an extract made from the wood of the *Aquilaria Agallocha.*—Hon. Ed.]

NETHERLANDS.

Manufacture of Artificial Rubber from Fish.

H. M.'s Consul at Amsterdam (Mr. W. A Churchill) reports that a factory is in course of erection at the fishing harbour at Ymuiden for the manufacture of artificial rubber from fresh sea fish, the process being the patent of a doctor of medicine at Amsterdam. It is claimed that the product has the same qualities as vegetable rubber and is not affected by benzine or by heat. It is calculated that fish rubber can be produced at a cost representing only about one-sixth of that required for the manufacture of real rubber ; the cheapness of the former is due to the simplicity of the process and to the manufacture of a valuable by-product in the shape of a concentrated tonic food containing phosphor albumen.

H. M.'s Consul adds that this new invention should stimulate the fishing industry, but need not increase the price of fish to the consumer, as several kinds of uneatable fish that are usually returned to the sea by fishermen would be of service to the new works. (C 4,687.)

A report on the process and products of this invention, by Mr. J. T. Norman, an English chemist, may be seen by British firms at the Commercial Intelligence Branch of the Board of Trade, 73, Basinghall Street, London, E.C.—[*The Board of Trade Journal.*]

SOME FACTS ABOUT CAMPHOR.

BY AMBROSE WARNER.

[From the *Agricultural Journal of the Union of South Africa*, Vol. III., No. 1, January 1912.]

Camphor is used principally in the manufacture of celluloid. The world's consumption is about 11,000,000 lbs. annually, of which 70 per cent. is used by celluloid factories, 2 per cent. in gun-cotton works, 15 per cent. for disinfecting and deodorising purposes, and 13 per cent. for medical preparations.

Japan, Formosa and China are practically the only countries of export, and the Japanese Government supplies about 70 per cent. of the world's output. Germany and the United States are the largest importers.

The price of camphor, wholesale, on the London market has varied over the last ten years from 1s. 4½d. to 3s. 6d. per lb., but the lowest market price was only touched when several factories commenced making synthetical camphor which, however, proved not only too expensive a process, but the camphor made had not the requisite properties, and it was also very highly inflammable, which resulted in several of the works being burnt down, and consequently all of them are now closed; there is, therefore, no competition with what is almost a Japanese Government monopoly.

The price in London to-day is about 1s. 6d. per lb.

Camphor is distilled from all parts of the camphor tree (*Cinnamomum camphora*), which is one of the most beautiful trees in the world, attaining a height of about 100 feet. Its home is in the Far East, but the trees have grown well in Ceylon, Malay Straits, Algiers, Florida, East Africa and South Africa. A Government report from German East Africa states that from plants grown there, only two years old, the camphor oil only differed from the Japanese oil in containing a remarkably large amount of camphor much higher than the Japanese oil.

In Ceylon the trees thrive at all elevations from sea-level to the highest mountains, and like a well-drained deep sandy loam containing good quantities of lime and potash.

The process of distillation is a very simple one, requiring no great amount of capital, and in the Far East it is done by the very lowest class of aborigines. In Japan the producers are by law bound to sell their output to the Government at a fixed price, which is a remunerative one.

In South Africa the profits on this industry with the price of camphor put at 1s. 6d. per lb. would probably amount to about £10 per acre after two or three years, increasing as the trees matured.

Care must be taken in securing the seed, as the Japanese have a way of "doctoring" it before it leaves the country in order to prevent it germinating; a favourite dodge is to kiln-dry it. The seed is about the size of a small pea and should be white and oily inside, and the embryo should also be white and plainly visible. Seed that has been "doctored" is usually discoloured or the embryo dark in colour. Being an oily seed, the germinating power only remains for about six months, so care must be taken that the supply is fresh. It ripens about November, and it should therefore leave China not later than the end of December. It should be packed in slightly wet charcoal, as this has been found to preserve it better than any other substance. The Agricultural Department of British East Africa received some from Japan in 1909 in excellent condition packed in this way.

Propagation.—The seed should be put in water and left to soak for twenty-four hours. Those that sink are more likely to

germinate than those that float, as the light seeds consist of little more than shells. The best seeds should be sown about 1½ inches apart in a bed of good soil well prepared by deep digging, well drained and free from drips off trees, the soil must be broken to a fine tilth and have sand added if it is not sufficiently porous. This is important, as the seeds take from seven weeks to three months to germinate, and they would be liable to rot if the soil held too much moisture. Sow ¼ to ⅜ of an inch deep, keep the beds well watered, and see that the soil is made firm but not tight.

In South Africa it would be advisable to erect a slight shed (open all round) to shade the seed-bed from the fierce sunshine. About 5,600 seeds go to the pound, for which a space of about four square yards is necessary, and this should average about 2,000 plants.

Transplanting.—When the seedlings are large enough to handle, it is better to transplant to 6 inches apart and leave them until they are 12 inches to 24 inches high, then they should be finally planted out 4 feet by 8 feet apart in rows across the direction of the prevailing winds.

If let alone in two years the trees should have attained a height of about 10 feet, but it is better to train them into the form of hedges about 4 or 5 feet high, and they can then be clipped four or five times a year with ordinary hedge shears. Only young stalks and leaves should be cut.

Yield.—Each bush should give about 14 lbs. of leaves and stalks per annum. There would be about 1,360 trees per acre, or, say, 19,000 lbs. of "flush." The minimum yield of camphor should be 1 per cent., or say, 190 lbs. camphor per acre valued at, say (only 1s. 6d.) £14 5s.

Distilling is a very simple business. The natives of Formosa and Japan until recently used a hollow tree trunk with a wood fire burning underneath and water dripping on it above; but of late years they rig up a wooden cask on a brick stove, put the flush mixed with water into it, light a fire underneath, and let water drip on to the top. In the lid is fixed some straw, and in that the camphor crystallises from the steam.

Other methods for distillation are used, and all give satisfactory results as long as metallic substances, such as iron, are avoided, as these are apt to contaminate the camphor.

Careful experiments have been recently carried out, and the following details of one might be useful :—

5 lbs. of young flush was put into a copper vessel with fifteen pints of water, and a glass dome luted on which was connected with a glass condenser. The water was heated slowly from below and a thermometer placed so as to register the temperature two inches above the water and flush. At 50° C. (122° F.) crystals of camphor condensed on the glass dome, which at 90° C. (194° F.) were carried back into the water by the condensed steam. At 100° C. (boiling point) the steam and camphor vapour was passing rapidly into the glass condenser, while the leaves were covered with oily drops of camphor. Distillation at 100° C. was continued for two hours, when 7·93 pints of water, containing camphor oil, had collected in the condenser. This was then passed through a wet paper filter to separate the camphor and oil from the water, 1·10 per cent. camphor and oil being obtained.

As a rule, the camphor is almost entirely distilled once during three hours, and a strong smell of camphor is given off as soon as distillation commences.

Camphor when first distilled appears to be practically free from oil, but actually oil continues to sink to the bottom of the mass of crystals for some months unless it has been expressed by centrifugal force.

The Japanese camphor is imported into Europe in tubs covered with matting, each placed within a second tub secured on the outside by hoops of twisted cane. No metal lining is used, and the camphor has therefore some of its superfluous moisture absorbed by the wood.

In Ceylon the cost of pruning, distilling, and putting the camphor on the market does not exceed £3 per acre.

Camphor oil is largely used in the manufacture of soaps, and no doubt Natal could use large quantities of it at good prices.

The camphor retailed at the shops is often to a great extent mixed with other cheaper ingredients, such as paraffin wax, and cannot always be taken as a guide to the nature of pure camphor.

The industry is one that is well worth trying in the warm and moister regions of the Union, and might become a valuable asset to the country.

Camphor trees, as is well known, make a very useful timber, largely used in the Far East for all sorts of purposes.—[*Tropical Agriculturist.*]

EUCALYPTUS OIL.

Enormous quantities of Eucalyptus oil have been consumed in the Australian mining districts in the processes of preparing sulphides of zinc and lead. About one-half pound of oil is emulsified by vigorously shaking it up with 100 gallons of water, and with this mixture the moistened or powdered ore is stirred up. The Eucalyptus oil absorbs the sulphide particles and carries them to the surface, together with the gold and silver contained in them, up to 25 per cent. of the actual content of the powdered ore being recovered by the process.—[*Capital.*]

DURABILITY OF WOOD CUT IN SPRING AND IN SUMMER.

Timber cut in spring and in summer is not so durable as that cut in winter, when the life processes of trees are less active. Scientific investigations sustain this statement. The durability depends not only upon the greater or less density, but also upon the presence of certain chemical constituents in the wood. Thus a large proportion of resinous matter increases the durability, while the presence of easily soluble carbo-hydrates diminishes it considerably. During the growing season the wood of trees contains sulphuric acid and potassium, both of which are solvents of carbo-hydrates, starch, resins and gums; they are known to soften also the ligneous tissue to a considerable degree. During the summer

months the wood of living trees contains eight times as much sulphuric acid and five times as much potassium as it does during the winter months. The presence of these two chemical substances during the growing season constitutes the chief factor in dissolving the natural preservatives within the wood and in preparing the wood for the different kinds of wood-destroying fungi, such as *Polyporus* and *Agaricus*. The fungi can thus penetrate more quickly and easily into the interior of the wood when these wood gums are already partly dissolved and available for their own immediate use. From this stand-point it seems that the best time to cut down the tree is in the winter when sulphuric acid and potassium are present to a much smaller degree, and the fungi will not be assisted in dissolving the natural preservatives in the wood. The amount of wood gum is always less and more easily soluble in sap-wood than in heart-wood and for this reason the former is usually regarded worthless for industrial purposes.—[*Scientific American.*]

ARTIFICIAL RUBBER.

M. Ostromislensky, a young and distinguished professor of chemistry at the Imperial Technical School of Moscow, while studying the properties of benzol found a substance the structure of which closely resembled rubber, and, acting upon that discovery, he has synthetically produced what is said to be a perfect substitute for natural rubber. The discovery has caused a great sensation in the rubber industry. The elasticity and resilience of the new substance are described as equal to rubber, and the price is 23 roubles (2*s.* the rouble) a pood (36·113 lbs.) The Russian and foreign rights have been acquired by Count Tatischeff, head of the United Bank, and of the Bogatir Rubber Company.—[*Indian Textile Journal.*]

PAPER FOR TYRES.

Pneumatic tyres of chemically treated and compressed paper have been brought to notice in France and Germany. The material is said to be as strong as steel and as elastic as rubber, yielding tyres that are noiseless, waterproof, and cheap.—[*Capital.*]

TRAINING CLASS FOR PROVINCIAL SERVICE CANDIDATES AT DEHRA DUN.

The following is the text of the Government of India Resolution on the above :—

"In the Circular from this Department No. 24—F.-196-3, dated the 6th August 1910, Local Governments were consulted as to the advisability of instituting, at the Forest Research Institute and College, Dehra Dun, an entirely separate course of training for candidates for direct appointment to the Provincial Forest Service.

2. Local Governments were unanimous in considering that a separate course for Provincial Service candidates is essential, and the Government of India have now obtained the sanction of the Secretary of State to the initiation of such a course with effect from November 1912.

3. The course of instruction, which will be of two years' duration, and the selection and appointment of candidates will be conducted under the following arrangements :—

The Secretary of State has drawn attention to the principle now accepted as the basis of the recruitment of the Imperial Forest Service, that all candidates in addition to a good general education must have passed with honours in a public examination for a degree in some branch of natural science held by a University in England. It has been found that, without a preliminary training in science, probationers are not able to complete an advanced forest course within a limited time, and his Lordship considers it will be found essential, if English experience is at all

applicable, that every probationer should have a good general education and a substantial knowledge of one or more branches of natural science. The Government of India desire that this point should be borne in mind in connection with the selection of candidates.

Considering the class of officials required for forest work and the various degrees of education prevailing in the different provinces, the Government of India do not think it necessary or advisable to prescribe for candidates any of the established educational qualifications, and they accordingly leave to Local Governments full authority to select candidates in such a manner as they think best subject to the condition that only candidates who are in all respects qualified by previous education, more especially in English and Mathematics, thoroughly to follow and profit by the course of instruction, should be nominated. Information regarding the degree of qualifications required in English and Mathematics will be found in the new rules for the course prescribed for the Provincial Forest Service, which are being circulated separately to Local Governments. The President of the Forest Research Institute and College will be empowered to subject any candidate about whom he has a doubt to a special examination in these subjects. He will also have authority, either as a result of such an examination or at any time during the course, to remove from the College any candidate whom he considers unable to follow the course prescribed. A physical test will be undergone by candidates on their arrival at Dehra Dun, followed by an examination conducted by a Medical Board. Local Governments will decide the extent of practical training probationers should go through prior to joining the College and the allowance to be given to them during this training. It is left to Local Governments to award stipends or scholarships to probationary students at the College in such manner as they consider suitable, subject to the condition that the amount granted shall not exceed Rs. 2,400 for the two years' course. The age of the candidates is also left to the discretion of Local Governments, subject to the proviso that without the special orders of the Local Government no candidates of less than

18 or more than 25 years of age should be sent for instruction. Similarly, it is left to each Local Government to decide as to the length of the period of probation to be required from candidates after the completion of the course and before appointment to the Provincial Service, provided that no such officer may be appointed substantively to the Provincial Service until there is an actual vacancy in that service for him, but candidates who have completed the course should, while on probationary service, be classed not (as has hitherto been sometimes the case) as Rangers but as Probationary Extra Assistant Conservators, on the scale of pay sanctioned in Circular Resolution No. 31-F.-166—4, dated 9th October 1906. Any candidate who is not appointed permanently to Government Service before attaining the age of 23 may be allowed to count, as service towards pension, any period of training or probation served after attaining that age. The number of candidates to be sent for instruction will be fixed in each year for each Local Government and, so long as the number of candidates prescribed is not exceeded, Local Governments will be at liberty to send either candidates for direct appointment or Rangers. Full discretion is left to Local Governments as regards the age at which Rangers may be sent, but they should be educationally qualified to follow and profit by the course of instruction and, as in the case of direct candidates, the President will have power to examine and remove any Rangers whom he considers unfitted to follow the course."

NOTES.

The Assistant Inspector-General of Forests.—Mr. Carr has proceeded on well-earned furlough and has been replaced by Mr. Cubitt, Deputy Conservator, on the Burma list.

The Provincial Service Course at Dehra Dun.—It has been definitely decided that this course will begin on the 1st November of the current year. The number of students in it will probably be limited to 18.

All selected students should join at Dehra on the 25th October so as to give themselves time to make preparations for the year's work. At present they will have to find their own quarters.

Creosoted Sleepers.— American creosoted pine sleepers have recently been imported into India for use on the Indian railways. The result of the experiment will be watched with great interest by the railway world.

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LIST OF THE TREES, SHRUBS AND ECONOMIC HERBS OF THE SOUTHERN FOREST CIRCLE OF THE C. P.

Prefatory.

An Introduction to a Forest Flora, or even a mere list of plants, is best prepared after all the available information contained in the list itself is to hand. As this is not yet the case with regard to the list of the Southern Circle, it is not proposed to do more at the present stage than offer a few prefatory remarks which have for their object the remedy of that very incompleteness which renders an Introduction at this stage inadvisable.

Until 1906 C. P. Forest Officers had no list of their important trees and shrubs except in the form of some appendices to Working Plans. Some of these were very incomplete or even inaccurate, others, like that prepared by Mr. Clutterbuck for Allapalli, exceedingly useful for the limited area with which it dealt.

In 1906 Mr. Hole, now Botanist at the Forest Research Institute, Dehra Dun, brought out a most useful list of the Trees, Shrubs and Climbers found in the Northern Forest Circle of the

Central Provinces which was reviewed in the *Indian Forester* in April 1907. This was followed up in 1908 by Mr. Witt's list of Trees, Shrubs and Climbers and other plants of economic importance found in the Berar Forest Circle which has been found of the greatest use not only in Berar but in parts of the Southern Circle. This was reviewed in the *Indian Forester* in May 1909. Mr. Hole did not pretend that his list was complete and only referred to it as a preliminary list. It was left to other Forest Officers to amplify it and send to him addenda as new species or localities were successively ascertained. The list now being prepared for the Southern Circle, it is desired, should be made complete before separate publication in book form, by the co-operation of all Forest Officers in the Circle, whose further contributions to the Flora the Editor has kindly consented to publish periodically in the pages of this journal. There are some Forest Officers in the Circle, or but lately left, who have a very thorough knowledge of the trees in their divisions together with their vernacular names, and Mr. Donald, a botanist as well as forester, has, I believe, already made a very complete list of the important South Chanda Flora (still in manuscript). With the aid of these officers and any other botanists outside the department who may be willing to help, it is hoped that an accurate list of vernacular and other names may be compiled, together with the chief localities and uses of the plants concerned.

With regard to these vernacular names it is hoped that some attempt will be made to indicate the language. This matter appears of greater difficulty in the C. P. than in other Provinces with which the writer is acquainted who is himself handicapped in the matter by ignorance of the C. P. dialects, but the difficulty should not be insuperable. Where the language is not known it is desirable to indicate the district.

A few Kol names are found in the extreme east, but the transfer of many of the small Native States to Bengal has removed nearly all the Kolarian element. The Baiga names seem very peculiar as they resemble ordinary Hindi, Gondi or Kol names applied to *other trees*. Thus they call the Toon, Lim or Mahalim

which induced some officers to take it as Ailanthus and they call *Acacia lenticularis*, Khair!

The following abbreviations have been adopted for names of languages and districts or forest divisions :—

Bal.	...	...	... Balaghat.
Bil.	...	...	... Bilaspur.
Bhan.	...	...	... Bhandara.
N. Ch.	...	...	... North Chanda.
S. Ch.	...	...	... South Chanda.
N, Ward.	...	...	... Nagpur-Wardha.
Rai.	...	...	... Raipur.

H., Hindi; Gond. or Gondi; Mar., Marathi; Chh., Chhattisgarhi; Baig., Baiga; Tel., Telegu; Bhum., Bhumia; Maria.

Where possible I have utilised the lists of trees drawn up in the following Working Plans and have adopted the vernacular names given. This has not been possible with doubtful species, *e.g.*, *Miliusa* is often confused with *Saccopetalum*, *Dillenia aurea* has been mixed up with *Dillenia pentagyna*, etc., etc. Where names are taken from Working Plans the abbreviation W. P. is added after the division. The lists consulted were drawn up by the following officers :—

Balaghat (Baihar and Raigarh)—Mr. Percival.
North Chanda—Messrs. Lowrie, Lemarchand and Langhorne.
South Chanda (Allapalli)—Mr. Clutterbuck.

H. H. HAINES.

I.—RANUNCULACEÆ.

So far neither **Clematis** nor **Naravelia** have been recorded but **Clematis** is common in Pachmarhi and is also found in Nimar. It will probably occur in the Maikal Hills.

II.—DILLENIACEÆ.

Dillenia aurea, *Sm.* Kalli, *Baiga*; Kalla, Karmata, *Gond*; China Kalanga, *Tel.*

A small crooked tree with large leaves which have a distinct petiole 1—3″ long. Fls. large yellow, *April—May*. Fr. *May—June*. The fruits are eaten.

Found in all divisions and will almost certainly occur in the Northern Circle. Common in the Harratema and Balabehra forests in Raipur. Both above and below the ghat in Bal. On white clay schists, Kukra, (Dhansua Range, Bal.). Chhaparwa to Lamni common, Lormi forests and Pantora Range, (Bil.), Elchil (S. Ch.). Most frequent on metamorphic rocks especially clay schists.

Dillenia pentagyna, *Roxb.* Kalla, Kalli, *Gond*; Mirchi, *Baiga*; Pedda Kalanga, *Tel.*; Kankera, *Mar.*

A straighter tree with even larger leaves and short amplexicaul petiole. Fls. yellow medium in clusters on the bare branches. Fls. *March—April*. Fr. smaller, eaten, *May*.

Less common and requiring moister localities.

Bal.:—in valleys, Batkari, Nahara valley (Dhansua Range) Dhiri-Mangli. Bil.:—Lormi forests (Chhaparwa, etc.), Sonakhan Range, Rai.; Elchil (S. Ch.); Durgapur, Moharli Range (N. Ch.). Cut back by frost at Kara (Dhansua Range, Bal.) where both **Dillenias** are found in association.

III.—ANONACEÆ.

Polyalthia cerasoides, *Benth. & Hook.-f.*

A small straight tree with numerous spreading branches, distichous lanc. or oblong lanc. pubescent leaves and usually solitary axillary greenish fls. on the new shoots. Fruit an umbel of red fleshy carpels.

Fls. *April—May*. Fr. *May—August*. Evergreen.

A tree of the moister forests only, Amjhar nala, Kanhargaon, Harunpaili Block, etc. (S. Ch.); Haveli Range (N. Ch.).

Polyalthia longifolia. *Benth. & Hook. f.* Debdar *H.*

Sometimes also called Asok, a name also applied to **Saraca indica**. A straight tree with long narrow shining undulating leaves, often planted.

Miliusa velutina, *H. f. & T.* Dom sal, Kari. *H.*; Karli, *Gond*; Pedda chilka duduga *Tel.* (*S.-Ch.-W.-P.*)

A tree rarely over 3 ft. in this Circle with large ell. or ovate leaves 4 to 10″ long more or less permanently pubescent beneath. Fls. green on long drooping pedicels, on new shoots. The bark is usually pale and fluted. Fls. *May*. Fr. *June*. Deciduous. Fairly common in the damper forests of Balaghat, Baihar Range, Sulsuli, etc., Pantora Range, (Bil.) frequent.

Saccopetalum tomentosum, *H. f. & T.* Kari *H.*

Thoska, *Gondi* ; Kutki, *Gondi* (Bal. W. P.) ; Chilka dudi, *Tel.* (S. Ch. W. P.)

A tree rarely over 4 ft. in this Circle with ovate-oblong somewhat aromatic leaves rarely exceeding 6″ pubescent beneath. Fls. purple on slender pedicels. Fr. an umbel of black fleshy carpels.

Fls. *May—June*. Fr. *June—July*. Deciduous.

Common in all divisions. The wood is valued for house poles.

Anona squamosa, *L.*

The custard apple is cultivated as also, to a small extent, is **Anona reticulata,** *L.* The Bullock's Heart.

IV.—MENISPERMACEÆ.

All climbers with palmi nerved leaves.

Tinospora cordifolia, *Miers.*, Gulbel, *Mar.*

Climbing shrub with succulent corky stems, entire cordate leaves and minute yellow fls. in racemes longer than the leaves. It sends down numerous long fleshy slender roots from the branches. Fls. *August—October*. Only seen near tanks, Nagpur-Wardha.

Cocculus villosus, *D. C.*

A slender grey villosely tomentose climber with deltoid to ovate-oblong obtuse leaves attaining 3″ by 2″ and axillary small

capitate cymes of minute fls. Druplets dark purple. Common everywhere in hedges, etc. Fls. *November—Frbruary.* Fr. *April.*

Cissampelos Pareira, *L.* Pahadmul, *Mar.;* Kurupahad *Gond.*

A slender climber with slender rhizomes to which it often dies back in the hot weather. Leaves often broader than long and usually peltate. Fls. minute. Male in corymbose cymes and Females in the axils of large bracts in racemes. Common. Fls. *June—October.* Fr. *November—January.*

V.--CAPPARIDACEÆ.

Crataeva religiosa, *Forst.* Uskeman, *Tel.*

A small tree with 3-foliate leaves and yellow and white flowers in corymbs. Fls. *March—April* with a new foliage. It is sometimes cultivated in gardens, and is entered as wild ("a moderate sized tree with 3-foliate leaves") in the Moharli W. P. under the name of Karangi pipal. Wild and sub-gregarious at Patanil (S. Ch.) fide Donald.

Capparis, grandis, *L. f.* Pachara. *Mar.;* Regguti (*N. Ch. W. P.*)

A small tree with pubescent often drooping branches, sometimes thorny. L. broad 2—3", often roundish. Fls. $\frac{3}{4}$—1" diam. white, *Oct.*

N. Ward. (Bapuwara forest); North Chanda; usually on cotton soil.

Pieces of its wood are strung together through the pith and worn as a charm.

Capparis horrida, *L.* Waghoti, *Mar.;* Reguti, *Tel.* (*S. Ch. W. P.*); Ketauni (N. Ch. W. P.).

A scrambling or climbing shrub with rusty pubescent shoots and stout recurved thorns. Fls. above the axils, white to pink, sub-solitary or several in vertical lines. Berry 1$\frac{1}{2}$" long. Fl.—*March April.* Fr. *June.*

All divisions, frequent.

Capparis sepiaria, *L.*

A straggling or climbing shrub with pale grey branches and recurved thorns, small white flowers in umbels and small black berries, size of a small pea.

Pipalkhot (N. Ch.,) Dhaba Range (S. Ch.)

Fl. *Nov.—Dec.*

VI.—BIXACEÆ.

Cochlospermum Gossypium, *DC.*

Galgal, *H.*; Gongal, *Mar.*; Ganeri, *Bhum.*; Konda gogu *Tel.* (*S. Ch. W. P.*)

Small tree with light fluted bark and spongey wood. Large yellow fls. while leafless, and palmately lobed leaves.

Dry localities. All divisions, common.

Fl. *January—March.* Fr. *March—June.*

Flacourtia Ramontchi, *L'Herit.*

Kakai, *H.*; Gandregu, *Tel.* (*S. Ch. W. P.*); Kanki, Katian, *Gondi* (*Bal. W. P.*)

A small tree or shrub, usually thorny, with crenate-serrate leaves and yellowish green one-sexual flowers $\frac{1}{4}''$ diam.

Fruit a red berry $\frac{1}{3}''$ to $\frac{1}{2}''$ diam., edible.

Fl. *December—March.* Fr. *April—May.*

Common in all divisions. Frequent as a shrub in scrub jungles.

VII.—POLYGALACEÆ.

Polygala chinensis, *L.* Bijnori, *Gond.*

A small plant 3—5″ high leafy especially towards the top, with pubescent stem variable leaves $1\frac{1}{2}$ to $3\frac{1}{2}''$ long and terminal and lateral capitate or sub-capitate racemes of greenish or pink zygomorphic flowers. Capsule 2-seeded membraneous. Fl. *June* to *November.*

The dried roots come into the market as cylindrical brown and wrinkled pieces about $\frac{1}{3}''$ diam. It is included in some of the leases for Minor Forest Produce.

Specimens received from Messrs. Beechey & Cole.

VIII.—TAMARICACEÆ.

Tamarix ericoides, *Rottl.* Jhao, *H., Mar.*

A shrub with erect branches clothed with minute sheathing amplexicaul leaves and with 2-sexual pink flowers in terminal racemes.

River beds, frequent. Katangi (Bal.). Belda (N. Ward.), etc.

Fl. Fr. *October—August.*

IX.—DIPTEROCARPACEÆ.

Shorea robusta, *Gaertn.* The Sal tree.

Sarai, *Gondi ;* Pinjal, *Gondi* (Bal. W. P.)

Bastar, Bil., Bal., Rai., usually following the line of the metamorphic rocks. Not found in the driest localities. It suffers from frost in some of the valleys of Baihar, Raigarh and Lormi Ranges.

X.—MALVACEÆ.

Malvastrum tricuspidatum, *A. gray.*

An undershrub with straw yellow flowers liable to be mistaken for **Sida** from which it may be easily distinguished by the bracteoles.

N. Ward. An introduced plant.

Sida veronicaefolia, *Lamk.*

An undershrub 1—3 ft. high (or sometimes herbaceous and procumbent) with sub-orbicular or ovate cordate leaves and pale yellow flowers on slender peduncles without bracteoles.

In all divisions. Fl. cold season, and also sporadically throughout the year.

Yields a fibre.

Sida glutinosa, *Roxb.*

Similar but taller and distinguished by the dense glandular hairs. Surera (N. Ward.), etc. Less common. Fls. *Aug.—Dec.*

Sida spinosa, *L.*

With cordate pubescent leaves and 1—3 spiny tubercles below them.

Fls. *Aug.—Oct.* Common.

Sida cordifolia, *L.*

An erect undershrub 2—4 ft. tomentose all over with ovate cordate obtuse leaves and straw coloured fls. $\frac{1}{2}$″ diam. Carpels with long awns.

Fls. *Aug.—Dec.* Fr. *Oct.—Jany.*

Sida rhombifolia, *L.*

Undershrub 1—4 ft. with thin or thick stellate hairs on the branches and rhomboid or obovate leaves with cuneate 3-nerved base.

Very common but especially in open situations in the rains and cold weather.

Sida acuta, *Burm.*

Undershrub 2—3 ft. high with very tough sparsely stellate hairy stems and lanceolate to ovate-lanceolate serrate glabrous leaves $1\frac{1}{2}$—$3\frac{1}{2}$″ long.

Waste ground, common. Fl., Fr. *Aug.—Dec.*

All the **Sidas** yield fibre.

Urena lobata, *L.*

Undershrub 2—$4\frac{1}{2}$ ft. high with sub-orbicular angled or slightly lobed leaves and pink flowers $\frac{3}{4}$″ diam., not racemose. Carpels glochidiate. Very common.

Fl., Fr. *Aug.—Dec.*

Urena sinuata, *L.*

Similar but the leaves cut beyond the middle into usually 5 oblong or lanceolate segments.

Fls. 1″ diam.

Frequent, in all divisions.

Urena repanda, *Roxb.*

Shrub 2—4 ft. with roundish leaves $2\frac{1}{2}$—$3\frac{1}{2}$″ diam. and pink flowers $\frac{1}{2}$—1″ diam. which are axillary and racemed. Carpels smooth.

Fl. *Sep.—Oct.* Fr. *Nov.—Dec.*

Glades in the forests. Bil., Bal.

Probably in all divisions.

Pavonia zeylanica, *Cav.*

An undershrub 3—4 ft. with hoary pubescent stems, lower leaves 4—5 diam. with 3 large acuminate lobes and rounded cordate base, upper lanceolate, all more or less dentate-serrate. Fls. $1\frac{1}{2}$″ diam. with linear bracteoles and large calyx, easily distinguished in fruit by the netted winged carpels. Fl. *Oct.* ? Fr. *Dec.—Jany.*

Pantora Range, Bilaspur, on the hills.

Abutilon indicum, *G. Don.*

An undershrub covered with a soft white close velvet with few or no long hairs. Fls. orange 1″ diam.

Head of many carpels truncate.

Fl. r. s. and up to *December.*

Frequent, but rather local and often near villages. N. Ward.

Abutilon muticum, *G. Don.*

4—6 ft. high with the stems and petioles densely villosely hairy, round cuspidate leaves softly white tomentose beneath and closely more roughly tomentose above, dentate to denticulate. Fls. orange usually on short axillary branches running out into terminal panicles. Sep. cuspidate. Carpels many, pubescent Umrer Range, (N. Ward.) Fr. *Sept.* Ft. *November.*

Abutilon graveolens, *W. and A.*

Stouter than the last, 3—6 ft. high, covered with a velvety tomentose with glandular pubescent and long soft hairs intermixed. Fls. $1\frac{1}{2}$″ orange with a crimson centre. Similar localities. Raipur.

Hibiscus Solandra, *L'Her.*

About 3 ft. high with polymorphous leaves lower simple or 3-lobed always with sub-cordate base and coarsely toothed, upper

3-lobed or 3-sect or small and simple. Fls. not seen, they are yellow according to F. B. I. but white and only $\frac{3}{4}$ to $\frac{1}{2}$″ diam. in the Pachmarhi plant, on long peduncles 1—2″ long jointed above arranged in loose often corymbose racemes. Capsule slightly exceeding the ·3″ long calyx 5-valved, cuspidate, sutures ciliate with bristles.

Sihawa Forests (Rai.) Fl. *Sep.—Oct.* Fr. *Nov.*

(*Note.*—Roxburgh correctly describes the flowers as white under his H. pumilus.)

Hibiscus panduræformis, *Burm.*

A tall herb up to 10 ft., lower leaves irregularly lobed, upper narrow, all coarsely irregularly toothed.

Fls. axillary and in terminal racemes 1—1·25″ yellow subsessile Bracteoles linear spathulate connate at base. Rai.; N. Ward. Fls., Fr. *Nov.—Jany.*

Hibiscus cannabinus, *L.*

A tall herb with large leaves of which the upper are deeply palmate. Fls. large over 2″ diam. white (rarely slightly yellow) with purple centre.

Cultivated, especially on rice lands, for its fibre.

Hibiscus Sabdariffa, *L.* Rozelle.

Shrubby. Glabrous except the flowers and fruit. L. with petiole often longer than blade which has a gland on midrib. Fls. $2\frac{1}{2}$″ on very short peduncles. Bracteoles accrescent with calyx at base. Commonly cultivated on cotton soil. Fls. c.s.

Hibiscus ficulneus, *L.* Ran bhendi, *Vern.*

3—4 ft. Stems nearly smooth or scabrous with tubercle based hairs or prickles. L. sub-orbicular very deeply 3—5 lobed with the lobes constricted at base.

Fls. white to pink in more or less leafless racemes.

Fls. *Sep.—Nov.* Fr. *Nov.—Dec.*

Lohara, Balod Range (Rai.); N. Ward.

Probably all districts.

Hibiscus cancellatus, *Roxb.*

A very hirsute or bristly herb with lower leaves sub-orbicular, large yellow fls. (with purple centre) on peduncles about 1" long in terminal racemes (and few axillary). Capsule sub-globose to oblong 1—1·75" hirsute with yellow hairs. Bracteoles persistent filiform. Rai.; Bil.; Bal. Fl. *Aug.—Nov.* Fr. *Oct.—Jany.*

Hibiscus esculentus, *L.* Bhendi, *Vern*

Erect 4—6 ft. Capsules long oblong.

Often cultivated.

Hibiscus rugosus, *Mast.* Pahari Bindi, *Vern.*

Recorded in "Wild Plants found in Nagpur" by Mr. Graham.

Thespesia Lampas, *Dalz.* Jungli Bendi, *Vern.*

A stout undershrub 4—6 ft. high with large yellow flowers and crimson centre. Two species are distinguished in the Addenda to the "Forest Flora of Chota Nagpur":—

(*a*) L. glabrescent and glaucescent beneath mostly deeply 3-lobed with very acute or acuminate lobes. Capsule 3-rarely 4-valved, oblong ·6—·8" cuspidate, readily dehiscent.

Common in all divisions.

(*b*) L. stellately tomentose beneath mostly simple and entire or with shallow blunt lobes. Capsule 5-rarely 4-valved, ·7"—1" broad ovoid blunt, tardily dehiscent, woody.

This has only been noted from South Chanda.

Both species and varieties fl. r.s. up to *October* and fr. c.s.

Kydia calycina, *Roxb.* Banga, *Gond* (Chh.?); Baranga, *H.*; Potri marra, *Gondi*; Botki, *Tel.* (S. Ch. W. P.)

The names Dhaman and Bhoti are often given from confusion with other trees.

A tree, small to m. s., with sub-orbicular palmately 5—7 nerved leaves, with a gland on 1—3 of the nerves beneath.

Fls. m. s., white in panicles from *Sept.* to *Nov.*, conspicuous in fruit from the 4—6 persistent spreading bracteoles.

Common in all divisions.

Bombax malabaricum, *DC.* Saori, *Mar.*; Burga marra, *Gondi* (S. Ch. W. P.); Burka burgee, *Tel.* (S. Ch. W. P.) Simar, Semal, *H.* Silk cotton tree.

A well known tree of which a nearly spineless variety with smaller deep red flowers is common in the C. P.

It grows best in sandy alluvial soil but nowhere attains the dimensions which it reaches in some other parts of India. It is one of the trees favoured for matches at Kota in Bilaspur.

Fl. *Jany.—March.* Fr. *March—May.*

XI.—STERCULIACEÆ.

Sterculia urens, *Roxb.* Kudlu, *Mar.* Kurlu. *Chh*; Karu, *H.*; Tabai marra, *Gondi* (S. Ch. W. P.); Tabsu, *Tel.* (S Ch. W. P.) Kasai (N. Ch. W. P.)

A large tree with white papery bark, large palmately lobed leaves and panicles of greenish flowers (while leafless).

Follicles pungent with bristles

Common on rocky hills.

Fls. *Dec.—Feby.* Fr. *April.*

Yields a gum and fibre. Planks are sometimes cut from it.

Sterculia villosa, *Roxb.* Buti (N. Ch. W. P.), Udal, *H.*

A large tree with light grey not papery bark, large palmately lobed leaves of which the lobes are often 3-partite.

Fls. yellowish and pink.

Raipur; Bil.

In valleys, not common. Planks sometimes cut from it. Bark yields a strong fibre.

Sterculia colorata, *Roxb.* Kanhakum, *Tel.*

A large or m. s. tree very beautiful in flower with its scarlet inflorescence. L. usually only 3-lobed in the adult (often more in seedlings) with only scattered stellate hairs,

Hillsides and well drained valleys.

Rai. (Salebhat); Dhiri-Mangli, Baihar and Raigarh, (Bal.) on the ghats; Machlighatta (S. Ch.)

Fl. *April.* Fr. *May.*

Deciduous *Feby.—May.*

Helicteres Isora, *L.* Marorphal, *H.*; Athai, *Mar.*; Muradphali (Bhan.); Nuldanti, *Tel.* (S. Ch. W. P.)

A large shrub with oblique pubescent 5—7 nerved leaves and scarlet lateral zygomorphic flowers. Fruit woody of 5 spirally rolled carpels on a long gynophore.

Common chiefly in rocky places on the cool slopes of hills, but also elsewhere. Fls. *April—Dec.* Fr. *Oct.—Jany.*

Mr. Cole states that the fruits pounded and fried in ghee, and sweetened, are used for colic and diarrhœa. As this is also the case in Chota Nagpur, they would appear to have some virtue.

Pterospermum acerifolium, *Willd.* Muchkand, *H.*

A handsome tree with palmately nerved cordate-based leaves white tomentose beneath and large white flowers.

Only near villages and often planted in gardens.

Eriolæna Hookeriana, *W. & A.* Bhoti, *H.*; Bhondia Dhaman, *Mar.*; Kunjai, *Gond.* (Bal.); Nar botku, *Tel.* (S. Ch. W. P.); Kutki, *Gondi* (Bal. W. P.) (N. Ch. W. P.). Sometimes called Bhoti Dhaman.

Shrub or small tree with broadly cordate coarsely toothed 7—9 nerved leaves white tomentose beneath. Yellow Fls. 1½ to 2″ diam. and ovoid tubercled capsules.

Fl. *April—June.* Fr. *Nov.—Jany.*

Wood is strong.

Melochia corchorifolia, *L.* Methuri, *Vern.*, Graham.

An undershrub with serrate plaited leaves and small white or pink flowers collected in dense heads. Common.

Fl.and Fr.r. s.

Waltheria indica, *L.* Halduli, *Mar.*

A hoary tomentose undershrub 2—5 ft. high with velvety ovate or ovate oblong sub-plicate leaves rarely 3″ long and small yellow or pink flowers in capitate cymes.

Exceedingly common on the open quartzite and sandstone plateaux of Raipur and (Sonakhan Range) Bilaspur where it forms a gregarious undergrowth. Frequent also in other divisions in open dry jungles. Fl. r. s. and c. s.

Buettneria herbacea, *Roxb.*

A branched herb with woody rootstock and curious small purple flowers, remarkable for the long slender tips and 2-fid appendages of the petals.

Common in rocky forests.

(*To be continued.*)

BURMESE *KAING* GRASS.

While at the Allahabad Exhibition, Mr. Raitt received specimens of a grass from Burma which was called *Kaing* and which promised to be an excellent material for the manufacture of paper-pulp. The correct identification of the species being, therefore, of some importance, the writer in October last asked Mr. J. H. Lace, Chief Conservator of Forests, Burma, if he could kindly have some specimens of *Kaing* sent to Dehra for identification. In response to this request a number of specimens have been received which show that all the species given below are called *Kaing* in Burma and it is possible that further inquiry will increase this list—

(1) *Saccharum spontaneum*, Linn., *Sit Kaing* (Shwegyin, Toungoo), *Bok Kaing* (Shwegyin), *Kaing Pwa*, *Kaing Ni* (Toungoo), *Kyanseingale Kaing* (Katha). *

* This is a very variable species both in India and Burma, but the various forms do not at present appear sufficiently constant to merit separate names and definitions. The principal forms are however in cultivation at Dehra and will be further studied.

(2) *Saccharum arundinaceum*, Retz., *Phaung Kaing* (Shwegyin), *Paung Kaing* (Toungoo and Katha).

(3) *Saccharum Narenga*, Wall., *Thetkkagyi Kaing* (Katha).

(4) *Saccharum fuscum*, Roxb., *Manaw-kun Kaing* (Rangoon), *Yin Kaing* (Shwegyin), *Thin kyan kaing* (Toungoo), flowers in December (Rangoon).

(5) *Arundo Donax*, Linn., *Alokyu Kaing* (Katha).

(6) *Phragmites Karka*, Trin., *Kyu-wa Kaing* (Shwegyin), *Kyu-kaing* (Toungoo and Katha).

(7) *Anthistiria gigantea*, Cav., sub-sp. *intermedia*, Hackel, *Kaing-deobok* (Katha District, 800'). Mr. Lace has recently sent specimens of two more forms of this species, *viz.*, sub-species *arundinacea*, Hackel, and sub-species *caudata*, Hackel, both collected on the Maymyo plateau, 3,500', but no vernacular names are given.

(8) *Andropogon Nardus* (forma *normalis* F. B. I.), *Kaing pyumi* (Katha).

(9) *Andropogon intermedius*, Br., *Kaing* (Rangoon).

(10) *Rottboellia Zea*, Clarke, *Pyaung Kaing*, *Kaing pabya* (Katha).

(11) *Rottboellia striata*, Nees, *Pyaungsa-gyi Kaing* (Katha).

(12) *Coix Lachryma-Jobi*, Linn, *Gyeik Kaing* (Shwegyin and Toungoo) *Kyeik Kaing* (Katha).

(13) *Tiraphis* (*Neyraudia* F. B. I.) *madagascariensis* var. *Zollingeri*, Hook f., *Nat-mya Kaing* (Rangoon), *kyunabin Kaing* (Toungoo), flowers in December (Rangoon).

(14) *Polytoca Wallichiana*, Benth, *Na-yar kaing* (Shwegyin).

(15) *Thysanolaena Agrostis*, Nees, *Thamasine Kaing* (Toungoo).

It is thus clear that Kaing is a general term applied in Burma to all large grasses growing in savannahs and swamps, the different species being as a rule distinguished by some descriptive epithet such as *Sit Kaing*, *Phaung Kaing*, and so on.

This interesting point could not have been settled without the kind assistance of Mr. Lace to whose magnificent collections

and unfailing interest in botanical questions the Forest Department, generally, and the Forest Research Institute, in particular, owe a heavy debt of gratitude.

As regards the value for paper-pulp of the species mentioned above, it must be noted that only a limited number of samples could be dealt with by Mr. Raitt owing to the short time at his disposal. In selecting the samples for Mr. Raitt, also, it was necessary to pay special attention to those species which were likely to be of most value on account of their wide distribution and frequent dominance over large areas, not only in Burma, but also in India. The species numbered (1) to (9) inclusive and (13) in the above list are, however, being examined by Mr. Raitt and his report dealing with them is expected to issue within the next 12 months.

It is hoped that Forest Officers in Burma will continue to take an interest in their forest grasses and to send specimens thereof to Dehra Dun for identification, so that more complete information may be obtained regarding the distribution of the various species, their vernacular names, time of flowering, habit, characteristic habitats, economic uses, whether they tend to occur practically pure or in admixture with other species and other points. The vernacular names given in the above list should be checked by further inquiries, and it would be of great interest if the English equivalents of the Burmese epithets could be supplied in each case. It is particularly desired that attention be concentrated on those species which are likely to be of most value, *i.e.*, those—

(1) which are known to be of considerable economic value ;
(2) which tend to occur more or less dominant over large areas and to give a character to the vegetation ;
(3) which tend to occur constantly in mixture with grasses of class (1) and (2) and in considerable quantity ;
(4) which are likely to be confused with valuable species when collected for paper-pulp or other purposes.

R. S. HOLE,
Forest Botanist.

FIRE-PROTECTION AND ITS RESULTS IN THE GODHRA RANGE, PANCHMAHALS.

In the issue of this magazine for October 1906, I tried to show the far-reaching havoc caused by the drought of 1899-1900 in the forests of the Godhra Range and in the January number 1908, I tried to show the effect of the drought on the regeneration in the same forests. I shall now try to give a brief description of the effect of fire-protection in the same forests.

In January 1908 I stated that an extensive part of these forests was annually burnt. This occurred till 1902 when specially protected areas, well fire traced and divided into sufficiently small fire compartments, provided with fire watchers, were introduced; even these were not immune to fire till 1906, the energy of the whole staff being engaged in extracting the dead and dying teak during that period. From 1906 strenuous efforts were made to combat the fires, and to achieve this object neighbouring villagers have from time to time had their privileges suspended and in the worst cases double grazing fees were imposed upon them. These, restrictions sometimes told rather harshly on them, and were at all times felt by them as hardships; but subsequently they got accustomed to them and the result is that the fires in the specially protected areas showed a decrease of from 19·04 to 5·7 per cent and in the remaining forests, protected solely by the guards without having any fire-protective operations introduced in them, from 31·08 per cent to 12·3 per cent. The result has been that in those portions of specially protected areas and in other areas saved from fire continuously for the last 10 years a great improvement in the natural regeneration of the forest is apparent, while the quality of the grass has also improved. Fire-protection has increased the fertility of the soil by adding to it the organic manure, which is a necessary nourishment for the tree growth as soon as the seeds germinate and their roots penetrate into the soil. The seedlings of teak, *Tectona grandis*; Khair, *Acacia Catechu*; Bia, *Pterocarpus Marsupium*; Royan, *Soymida febrifuga*; Dharida, *Anogeissus latifolia*; Mokha, *Schrebera swietenioides*; are found in numbers in the portions protected from fire. In the northern portion of

these forests the grass is very high and dense, and the seeds find some difficulty in reaching the ground, but there too they have made their way somehow or other, and the seedlings of various species are found though not so numerous as in other places. They are doing good to the forests in converting pure teak into a mixed forest. This is not the only advantage the forests have gained by continued fire-protection, changes in the growth of grasses are also noticed in various places. The grasses at present prevalent are—(1) Karedi, *Apluda varia ;* (2) Sunkhli, *Andropogon contortus ;* (3) Karvat, *Andropogon foveolatus ;* (4) Jinjwa, *Andropogon annulatus ;* (5) Bhusi, *Eragrostis tenella ;* (6) Bhathi, *Anthistiria cilata ;* (7) Gandheli, *Iseilema Wightii ;* (8) Khavo ; (9) Dab.* Out of these Jinjwa, Gandheli, Bhathi and Khavo are considered good fodder grasses and the rest bad except Sunkhli which when young is relished by cattle. The constant burning of the forests in former years had allowed the coarser grasses like Karedi, Sunkhli and Dab to usurp the place of finer ones, but since the introduction of fire protection the coarser grasses are in most places dying out and are being replaced by the finer ones like Jinjwa, Gandheli and Khavo. Even Bhusi which is a very short grass growing on very poor soil and which prevents the germination of any seed except Royan, is found in most places displaced by Jinjwa and Gandheli in bunches under whose shade are now found seedlings growing up where there were none before. The people of the surrounding villages have also now begun to understand that the best fodder grasses are now replacing coarser ones on account of the keeping out of fires from the forests; and it is therefore hoped that the internal fires in these forests will be stopped altogether in a few years, though the fires entering the forests from outside the boundary, which is surrounded by the forests of Native States, will be difficult to stop until some settlement is arrived at with the chiefs of those States.

AMABALAL K. DEAR,
Ranger, B. P.

* Probably *Eragrostis cynosuroides.*—(Hon. Ed.)

MESSRS. BECKER GRAY & CO.'S LAC FACTORY AT CHAMPA IN BILASPUR DISTRICT, C. P.

This lac factory is situated on the banks of the Hasdo river near Champa Railway Station. It is quite a new enterprise and in fact had only been working for a few days before Mr. Campbell, the manager, very kindly showed me over the factory and explained the processes to me.

Messrs. Becker Gray & Co. have, I understand, started the factory for the conversion of stick lac into button or shell lac in this lac growing centre and market with the object of reducing middleman's charges and saving freight on the carriage to Europe. Most of the lac received in the factory is still on the stick and has not been scraped off as one so often sees done in the forest. The first process of the factory therefore is to separate the pure lac from the wood and other refuse. To do this the lac is first crushed in a grinding machine and then passed through a sieve. This gets rid of the larger pieces of the wood and dirt. After this the lac is winnowed and then soaked in large stone vats. Great trouble is taken in the factory to remove all traces of colouring matter from the lac before manufacturing the shell lac. Most of the coloured lac is in the form of round hollow bubbles from which the insect had not swarmed before the collection of the crop. This lac floats while ordinary solid lac does not. In making the raw material therefore in the large stone vats the coloured lac with any sticks left in it floats on the surface of the vats. It is thus collected, separated from the dirt, crushed and thoroughly washed. This process removes most of the colour but to complete the removal of all traces of colouring matter, the lac is finally treated with Fuller's earth and then dried to be ready for conversion into shell lac.

I was particularly struck with the great care that is taken in the factory to remove all colouring matter. The quality of shell or button lac is judged in the market by its transparency and absence of colouring matter. Another point which struck me very much was the enormous trouble that is taken to prevent any form of waste. The factory is made to drain from all points in

which water is used to a tank in which the red coloured washings are collected and any lac which finds its way into it is extracted. This water is of a deep red colour and is drained off into pits outside the factory. When the pits are dried up lac is extracted by a steaming process from the cake formed in the bottom. Even the sand and earth on the floor of the factory is scrupulously treasured up with a view to the extraction of any lac that may be found in it.

After all waste material has been thoroughly treated to make sure that no lac has been overlooked, the cleaned lac is dried in a large cement floored quadrangle made for the purpose. After the drying it is placed in cylindrical sausage-shaped cloth bags of a length up to about fifteen or twenty feet. It is then ready to be melted.

In melting large half open charcoal retorts are utilised. The long sausage-shaped bags of lac are held at one end by a man who slowly revolves the bag before the furnace, the man at the end nearest the furnace is continually busy with the lac as it exudes from the bag owing to the heat. His business is to see that the lac does not become charred or burnt and that as soon as it has the right colour it is taken off the surface of the bag and put into iron trays to cool as button lac. This is clearly the work of an experienced expert and to carry it out special men are imported from Mirzapur.

The factory manager estimated that he would be turning out forty maunds of button lac a day and to make this would require forty maunds of charcoal. If the factory is working throughout the year this would mean a market for at least 5,000 maunds of charcoal per annum; a fact worth considering, when one thinks of the wretched prices for firewood that we get in some divisions of the C. P. in coupes even near the railway.

Labour appears to be a source of some anxiety in the factory. At present everything is worked by hand and the more important operations have to be carried out by expert labour from Mirzapur which I fancy is not cheap On the other hand the Chattisgarhi

no doubt could learn the work but he is a lazy beggar and there seems little chance of his taking to it.

Mr. Campbell told me that there is some idea of taking electric power from the Hasdo river—a plan which if carried ou would reduce the labour by 66 per cent. It is hoped that this will be a success and that Messrs. Becker Gray & Co.'s enterprise will be suitably rewarded. The starting of the factory will create a better market for lac, as well as a demand for charcoal and wood for making into packing cases. I cannot conclude this note without acknowledging my great thanks to Mr. Campbell for his courtesy in letting me see the factory and taking so much trouble in explaining the processes to me.

JAMES W. BEST,
Divisional Forest Officer,
Bilaspur Division.

PROGRESS REPORT OF FOREST ADMINISTRATION IN THE MYSORE STATE FOR THE YEAR ENDING 30TH JUNE 1911.

As Mysore is one of the most progressive Native States we have read this report with some interest. The area of the State forests has increased by some 22 sq. miles while that of the reserved lands by 70 sq. miles, they now cover 840 sq. miles. This nomenclature "reserved lands" seems to be confined to Southern India, we imagine that their status is more or less that of "protected forest" and we do not see why they should not be frankly termed "protected forests."

Working-plans have not made the progress that we would have liked to see. Apparently 1,939 sq. miles out of a total area of 2,595 sq. miles of reserved forests are not as yet under systematic management. No new plans were undertaken during the year nor were any new plans sanctioned by Government, while the provisions of existing plans have not been fully carried out.

On roads an expenditure was incurred of Rs. 11,237 ; looking to the large surplus of the province and the extensive area of the

forests, this expenditure might well have been increased. Building operations have shown good progress, some Rs. 39,000 having been spent on them.

Forest offences are somewhat rife. The number of cases dealt with by the Magistracy was 57 of which 22 ended in convictions. 22 out of 57, however, does not make 61 per cent as stated in para. 20 of the report. 177 cases of injury to sandal trees were reported. In the Kolar Division there were 7 such cases which ended in convictions, a total of Rs. 580 in fines being imposed, of which only Rs. 18 was duly recovered ; this is rather a travesty of justice.

Fire-protection was attempted over 1,487,000 acres, of which 97,000 acres were burnt. The measure of success varied considerably in the different divisions, one division showing 99·9 per cent. and another 73·1 per cent.

Spike disease still continues with dire results. In two districts alone over 70,000 sandal trees and plants had to be uprooted. It may be noted that the investigation of this disease is proposed to be taken up through the agency of the Forest Research Institute, though it is difficult to see how this can be efficiently undertaken until the staff of the Institute has been strengthened. However, we can only hope for the best.

Sowing and planting operations were carried out over 53,000 acres with somewhat doubtful success. It would probably be advisable to concentrate operations over smaller areas.

Passing now to the financial returns, 2,469 tons of sandal wood were sold yielding nearly 11½ lakhs of rupees. This was exclusive of chips and sawdust. The average price per ton including the two above items was Rs. 471 as against Rs. 461 in the previous decennial period.

The total revenue for the province was Rs. 20,89,000 with a surplus of Rs. 14,06,000 or more than 2 lakhs above that of the previous 10 years. With this large surplus it would seem expedient to improve the pay and prospects of members of the Department, and we will watch with interest the result of the reorganisation scheme that has been placed before the Mysore Government.

The report is lucid and interesting but it makes us feel that much more might be done and various improvements carried out if the Department were better manned. In order to allow of greater progress in working plans, sowing, planting, etc., we cannot but think that the Darbar would be wise to divide up the province into two circles at any rate for a period of years. The charge seems too large for one Conservator, looking to the inadequacy of the staff and to the large amount of supervision and administrative work that is evidently necessary. The Mysore Government must, however, be congratulated on having retained the services of Mr. Muttanah, who, in spite of many obstacles, seems to have kept things going and to have fully worked up to the reputation which he deservedly enjoys.

WITH THE JUNIOR CLASS IN JAUNSAR.

The Forest College at Dehra Dun is lucky enough to have at no great distance an ideal retreat for the hot weather, and the two classes annually at the beginning of May spend a couple of months in the splendid Himalayan forests of Jaunsar. Going straight west from Dehra for 30 miles along the Dun we meet the Jumna close to where it is joined by the Tons river and start the long gradual ascent to Chakrata. From the tea gardens of Ambari the cart-road climbs slowly up a long bare valley for 26 miles ending at Chakrata at 7,000 feet. Chakrata and Kailana extend over some four miles along a ridge projecting south from the hills and are pleasantly wooded all round the houses and cantonments, with steep bare grassy slopes below, which, interrupted by small plateaux of wheat-fields and villages, stretch down to the distant valleys of the Jumna and the Tons. We halt here for two or three days to see the fuel depôt and cantonment forests and then start off for the first camp, a three mile march with a rise of 2,000 feet ending at Deoban, where a couple of forest bungalows with Range and Students' quarters make a little colony at 9,000 feet. From the terrace outside the bungalow a splendid view of the distant snows is usually to be had, sometimes extending as far as the peaks

of Nanda Devi and Trisoul to the east behind Naini Tal, and the cold air cools the fevered brows of some of the students from the plains who have had a good deal of the *ghi* taken out of them by the steep climb. Round the bungalow the forest consists chiefly of the dingy *Karshu* oak, wrapped in mantles of moss, but a little lower down splendid woods of spruce and silver fir begin, with scattered plantations of blue pine and deodar. From Chakrata View, just to the south of the bungalow we get a glimpse of the distant and giddy Charleville Hotel at Mussoorie, and the jagged outlines of the Siwaliks meet our view, low and continuous beyond the Dun, when not hidden by the thick hot weather haze that creeps up the valley of the Jumna. A distant mass of smoke on their slopes claims our sympathy for the Divisional Forest Officer, Dehra Dun, whose percentage of successful fire-protection of his sal forests has evidently been reduced. At Deoban we spend a week or ten days, laying out hill roads, counting sample plots of natural regeneration, learning the difference between a shade-bearer and a light-demander, and absorbing an assorted stock of sylviculture in all its branches. Nursery work is done in detail, fortunately under better conditions than last year when the snow had to be dug away before work could go on. Five hours in the forest, from seven to twelve, gives us an appetite for tiffin, and a lecture is usually given in the afternoon on the old tennis court. Our next camp is at Bodyar, some seven miles off to the west, a beautiful march through the forest along the narrow hill roads that run in all directions round the Jaunsar hills. A short descent takes us out of the oak and into a large belt of spruce and silver fir which continues almost to Bodyar where the deodar begins at about 8,000 feet and runs down through a most picturesque valley below the comfortable little three-roomed bungalow perched on the slope. This is the land of plantations alluded to in the journals belonging to the Division, and the subject of flattering and sarcastic remarks of Conservators and Inspectors-General of bygone days. The green of the scattered deodar and blue pine plantations, pure and mixed, all over the valley, contrasts with the heavier masses of spruce, silver fir, and deodar forests below the

mountain tops, and show up the bare patches on the hot southern slopes where numerous efforts have been made to sow and plant, in many cases with doubtful success. Deodar grows about one foot each year in the plantations and blue pine nearly twice as fast, and there is no lack of areas in which the students can make measurements and countings. Below the higher wooded slopes deep rocky valleys, full of maples, *Moru* oak and wild strawberries, join to form the sources of tributaries of the Tons, and in these wild and lovely spots the lucky shikari who is early enough afoot finds the black bear, the goral, or the musk-deer, or drives the pheasants across the narrow glens between the lower plantations. Of recent years the bears have developed a great liking for the inner bark of the deodar, and have done great damage by taking the whole of the bark off groups of trees three or four feet in girth in some of the older plantations, as well as in natural forest, so that the Divisional Officer is pleased to hear of their execution. At one place outside a small cave the whole of the bark up to 12 feet from the ground had been removed, and the trees will die in a year or two.

On each side of the Bodyar valley rises a hill over 9,000 feet high, Lokhandi, with dense silver fir on its slopes, and Moila, with a considerable area of grassy downs where the Jaunsari shepherds bring their flocks of goats and sheep. In the hollows are built stone altars of the family bible pattern on which fires are lit at night to scare away cockatrices, and the flocks are further guarded by numerous savage dogs which wear broad iron spiked collars to protect them from panthers. The shepherds are quaint uncouth beings who seem to camp cheerfully among their animals whatever the weather, and are continually calling and whistling to them as they stray along the higher slopes under the spruce trees where the forests are usually open to grazing. A halting conversation which I carried on with a shepherd in a mixture of Burmese and Jaunsari Hindustani was further complicated by the curious habit which he seemed to have acquired of giving a little whistle between every two or three words.

Konain and Mundali, the other two places at which the Junior Class camps, are situated amid older forest and are both very

picturesque. Steep hills rise on at least one side and very fine old deodar, spruce and silver fir forest cover most of the steep slopes. A good deal of deodar is being felled and sawn on the spot into sleepers which are carried down the hills by precipitous paths by coolies to the nearest floating stream, down which they float to the Tons during the rains. After the rains they are floated down the Tons to the boom near Kalsi where they are caught and rafted to the railway. Contractors pay fifty or sixty rupees per tree and felling is done for them in the best deodar forests by Government as their own men fell so carelessly that many young trees are destroyed. Few of the tramways, sledge-roads, and slides formerly used in Jaunsar are now to be found as extraction is done by the contractors, but a tramway and a fuel shoot are used to bring in fuel to Chakrata.

The story of the end of the Thadiar wet slide is thus told by Mr. Gleadow in his account of the school tours in Jaunsar in 1898 and 1899:—

"At 6 P.M. on the 8th August 1889 a furious storm broke over the Deota ridge, 6 inches of rain being registered in a few hours. About 10 P.M. a tremendous flow of water, mud, and débris of all kinds reached the head of the slide, the water, from the marks left on the banks, having been about 40 feet deep. This flood swept down the valley in a series of rushes caused by the temporary damming up of the ravines at narrow places, and in the course of a couple of hours it completely wrecked and carried into the Tons river nearly the whole of the timber slide, notwithstanding the fact that it was in some places situated 50 feet above the stream. The catastrophe was unfortunately accompanied by the death of 12 chowkidars who were asleep in a cave near the head of the slide, 20 feet above the stream. Their bodies were never recovered, having been apparently ground to paste in the mud and boulders. The transporting power of the torrent was enormous, large boulders weighing from 20 to 100 tons having been carried along for hundreds of yards, by means of the mud, which being afterwards washed away, these boulders may now be found deposited high and dry along the bed of the Thadiar Khud. About 36,000 sleepers were

also washed into the Tons river from Thadiar depôt. Of these about 10,000 were never seen again and the total loss caused by the flood amounted to about Rs. 40,000 together with the 12 lives referred to."

In the hot weather and at the beginning of the rains the flowers in the hills are in many places a continually changing delight. Anemones, *Aquilegia*, *Delphinium*, *Morina*, ground orchids, lilies, and many less conspicuous flowers cover the ground in great patches while the flowering shrubs, Clematis, *Schizandra*, *Indigofera* and the two species of *Deutzia* provide beautiful masses of colour beside the dark conifers. In June the ground in places is covered with the flowers of the snakeplant, an aroid with a overhanging cobra-like spathe, and in the valleys the bushes of *Cornus capitata* are covered with flower and can be seen for miles. In the Jaunsar ointment there are however several flies. One is the small *Potu*, the blister-fly, and another is the Jaunsari himself who appears to be an uncouth and conservative being, given to little work and less washing and to living as far as possible on the labour of his hereditary slaves, if fortunate enough to possess any. We had little to do with the villagers beyond turning them out in hundreds to carry our kit from one camp to another and this work they performed at an incredibly slow pace.

Another fly in the ointment is reported by Assistant Conservators to be the necessity of climbing almost perpendicular cliffs of great height to mark deodar for felling.

Some of the picturesque aspects of Jaunsar are fully appreciated by the students, as shown in the following extracts from their journals:—

"I happened to see two herds of sheep grazing on the hills. No one can feel the greatness of the day except myself who saw these poor and timid creatures going up and down the slopes.....

Our Instructor was then kind enough to dismiss us and what to speak of our joy—we ran as soon as our legs could carry us and having appeased appetite in the city, proceeded to the camp.....

After meditating a while over this blank in the forest, we proceeded to Snow View and admired the picturesque view administered by the surrounding hills.....

Yellow and white flowers were blooming over the green velvet spread by the nature. How interesting it was for me to see the lonely sheep bleating in the meadows.....

Contractors are generally Bunyas who earn a lump sum money of profit.....The town of Kalsi is really beautiful and charming and boasts of having a post-office, school and police-station, which are with one temple, the only beautiful and splendid buildings. The street is composed of a few wretched shops, the surroundings of which are dirty and filthy..... Attention must be paid to the little seedlings until they catch hold of the existence..... The view at Konain is very beautiful and picturesque. The weather is an enjoyable one. The cool breeze refreshes the mind. Near the camping ground is a potato field in which the dirty people are engaged in weeding the potatoes."

CORRESPONDENCE.

TO THE HONORARY EDITOR, INDIAN FORESTER.

PROPOSALS FOR THE INSTITUTION OF AN ANNUAL INDIAN FOREST SERVICE DINNER IN LONDON.

19, LINTON ROAD, OXFORD.
1st July, 1912.

DEAR SIR,—It has lately been suggested that some steps might be taken to start an agency in England by which a register could be kept up of the addresses of all members, past and present, of the I. F. S. at home, with a view to arrange for the institution of an annual Forest Service dinner in London. The dinner would be a purely social function to bring together members of our service as a whole, and all controversial subjects and personal animosities (should such exist) will be put aside.

A set of proposed draft rules, laying down the lines along which such a Dinner Club could be run, are herewith circulated. I should be much obliged if you will kindly inform me by means of the enclosed post-card whether you do or do not agree to these proposals.

If it is found that the members of our service are generally in favour of this scheme, further steps will be taken for the formation of a representative Committee from Forest Officers at home to pass the rules and to arrange the details of the dinner, so that the first dinner may be held on Thursday, the 26th June 1913.

Messrs. Grindlay & Co. would, I believe, be quite prepared to act as *Treasurers* and *Bankers* in the event of an Indian Forest Service Dinner Club being started; and Mr. Austin Low, a Partner in the Firm, who has managed the I. C. S. and several other Annual Dinners since they originally started, would probably agree to act as *Honorary Secretary*.

It is also hoped that a grant to start the Club may be obtained from the I. F. S. Association.

Yours truly,
A. M. CACCIA.

PROPOSED RULES OF THE INDIAN FOREST SERVICE DINNER CLUB.

1. That any officer shall be eligible who has served, or is serving, in the Indian Forest Service.
2. That an Annual Dinner be held in London on the last Thursday in June.
3. That the time and place of the Dinner be notified two months beforehand to all Subscribers, retired or on leave, and in the "Indian Forester."
4. That an Annual Subscription of Two Shillings and Sixpence be paid by each member resident permanently in the United Kingdom. Members not so residing will only be asked to pay the subscription of Two Shillings and Sixpence for the year in which

they signify their intention of dining. Such subscription to be paid on or before the 1st of March of each year to Messrs... ....., who have kindly consented to act as Treasurers.

Any member wishing to compound his Annual Subscription may do so by paying a lump sum of ten shillings, thereby becoming a Life Member of the Club.

5. Such subscription to go towards lessening the cost of the Dinner, and defraying the expenses of printing, advertising, etc.

6. All officers desirous of joining the Club to intimate the same to the Hon. Secretary for submission to the Committee.

FOREST LOANS.

SIR,—In your leading article in the *Indian Forester* for July you expressed a desire for further correspondence on the subject of forest loans.

For the most part your proposals seem to me to amount to little more than that we could be given facilities to carry out projects which are insufficiently attractive to appeal to private enterprise. Well established firms with good connections in London or Glasgow seem to have no difficulty in obtaining as much capital as they require even without going to the open market, and if it can be shown that good money is to be made, I do not think the large amount of capital required often proves an insuperable obstacle. If therefore we rush in where experienced businessmen fear to tread there is, I think, a danger that we may find ourselves engaged in very doubtful and speculative enterprises, and that in some cases we may fail to bring them to a successful conclusion.

With regard to the question of departmental extraction of teak in Burma I do not think you have got the facts quite correct. In the first place I think you have greatly under-estimated the loss incurred by reverting to the purchase contract system. So far

as I can judge the net profit per ton of teak averages somewhere about Rs. 50. I was indeed informed on good authority that the profit on teak extracted from the Pegu Division amounted to Rs. 90 per ton, but this seems incredible. Under the purchase contract system, however, the maximum royalty is Rs. 35 a ton, and what with allowances, refuse, timber, etc., the average profit works out, I believe, to about Rs. 25. I regret that I cannot give any actual figures for any division. As Administration Reports are supposed to contain all useful and important statistics relating to forest work one would of course expect to be able to find them in these documents. These figures are however of some interest from the point of view of the history and progress of the Department and perhaps some one will therefore place them on record. I think it would be proved that there is a loss of about 50 per cent.

Where however you have, I think, made the greatest mistake is in thinking that departmental extraction means at all what it implies. "Departmental extraction" as the term is understood in Burma does not involve any interference with private enterprise, nor does it necessarily require that Government should provide any capital whatever. It merely means that under this system teak is brought to Rangoon and sold there by auction, whereas under the purchase contract system the entire yield of a forest is alienated for a period of years in consideration of a fixed royalty payable when the timber is extracted.

It was Sir Dietrich Brandis who introduced the system of departmental extraction, and the early records are full of the bitter opposition he had to face on that account, especially in 1860—62. He was attacked on all sides and was only partially successful. In introducing the system he financed some of the Karens, a hill tribe of *taungya* cutters living in the most valuable parts of the reserves, to buy elephants, probably intending thereby to induce them gradually to give up cutting taungyas, while at the same time utilising their knowledge of the jungle, capability to withstand fever, etc. It is perhaps on account of this origin that departmental extraction has always been carried out by petty native

contractors owning seldom more than ten elephants, but the system is of course equally well adapted for large firms owning several hundred elephants.

Brandis' policy was, however, reversed a few years ago when departmental extraction was abandoned in most of the remaining forests. This step was certainly not opposed by administrative forest officers, and in fact it was, I believe, mainly on their advice that the change was made. Few divisional officers realised, I think, that any change was contemplated, otherwise I for one would have ventured to record a timid protest. The change was, I understand, justified on the grounds that these petty Government contractors carried out their work slovenly and badly, but contractors will be contractors, and even immaculate purchase contractors in whose spotless integrity we had such confidence that on that account we waged a war on their behalf, have been known to commit irregularities such as felling large quantities of green teak. A certain amount of humour was therefore shown by our administrative officers in claiming as a fault of the system a state of affairs due entirely to their neglect and incapacity to realise that some supervision was necessary.

However the leases given out have tied our hands for the next 30 years or so, those responsible for the step have retired, departmental extraction in the small remaining area where it is still permitted has been reorganised on business principles. Nothing can now be done and therefore it seems to me that the less said about the matter the better.

Although many officials are doubtless extraordinarily able men, yet somehow or other Government service does not seem to stimulate those qualities which make for success in business. If however as a quasi-commercial department we possess exceptional genius for finance and aptitude in business, there appears to be ample opportunities to satisfy the most exacting. Our philanthropy has retarded the expansion of revenue while simultaneously, ambitious schemes to strengthen all branches of the establishment have caused a steady increase of expenditure. The result seems to be a pretty tangle in which skill is required to find means to enable

this extra establishment to increase the output of work. Again, we are at present driving an inflated revenue owing to the existence of overmature trees, and it would therefore be of more than sentimental interest to get a clear idea of what the outturn will be when the surplus is removed. Our principal sylvicultural work is fire-protection which is admitted to be injurious and it would not be altogether superfluous to ascertain whether there is any profit in it, and if so, what profit. We have had ample time to effect considerable improvements, but it would be worth while to calculate more accurately what progress has been made and to what extent we have added to the capital value of our reserves. Such matters fall within the legitimate sphere of our activity and it is on these that I think we should display our genius rather than in launching out on speculative industrial undertakings.

TAWTHA.

OBITUARY.

DEATH OF MR. R. C. V. PALMER.

A cable advice records the death of Mr. Ralph Crisford V. Palmer, Extra Assistant Conservator of Forests, Lower Burma, from dysentery, on Monday. Deceased was in his 34th year, and came from Sydenham.—[*Timber Trades Journal.*]

FLOATING FACTORIES FOR WATERWAYS.

There are certain forest products which exist in large quantities in India but which are rarely amenable to industrial treatment because they are inaccessible. Their inaccessibility arises in some cases from mere remoteness from marts and industrial centres. Even where they are found in large quantities, there are often no adequate communications, or the distances are so great that heavy transportation charges would be incurred in bringing them to market. In other cases, the difficulty arises from the circumstance of their being found at any one place in quantities too small to recoup either the cost of collection or the cost of erecting at a fixed point any appliances for their primary treatment or manufacture. The bad surface of the ordinary country road in India adds greatly to the labour of bringing in bulky raw materials that contain a large proportion of waste ; and, when such roads have been rendered soft by rains, the difficulty is enhanced.

Timber, tanning materials and waste wood for distillation are examples of such products ; and, where roads alone are to be relied upon, it is often impossible to make any use of the large supplies. But in parts of India—as for instance in Lower Burma —there are long stretches of waterways which are not only easily navigable but which bear upon their banks large quantities of valuable raw materials. It is probable that at some points these exist in quantities sufficient to warrant the erection of plant on a large scale. But such a venture involves many considerations besides that of the raw material. These fall under such heads as fuel, water, labour, stores, repairs, freedom from surface water in rains, and so on. Even under favourable conditions, it is a feature of such enterprises that, as adjacent supplies are exhausted, the manufacturer has to go further afield with the possibility that he may ultimately have to dismantle his factory and move it to another point. These risks are often sufficient to deter the capitalist from such a scheme ; but it seems quite possible that the existence of waterways navigable by craft of considerable size may be found to offer a solution of the difficulty. Not only might the comparative cheapness and constancy of water carriage enable a

manufacturer to bring his raw material to a large factory at a fixed point, but it is quite conceivable that such industries as can be efficiently conducted on a relatively small scale might be carried on by means of machinery installed in one of the commodious flats or barges that are used in those waters. Such a floating installation could move freely about the creeks of Lower Burma, for example, could come into operation where supplies of raw material existed, and could proceed periodically to Rangoon for overhaul.

One of the most familiar types of flat in the creeks of Burma has a length of 200 feet, a beam of 27 feet and a depth of 8 feet 6 inches. This type of flat has a draft, when empty, of 1 foot 6½ inches, lifts 11¼ tons per inch immersion and carries, at a laden draft of 5 feet, about 467 tons.

It will be seen that such a flat could carry a considerable weight of machinery and materials. The finished product would no doubt be sent forward by the steamers which traverse the waterways daily.

One of the simplest applications of the proposal would take the form of a floating sawmill. It is understood that certain useful timbers such as *sundri* (Heritiera fomes) exist in considerable quantities in the creeks but are shut out from use by two conditions. The first is that they are too heavy to be floated by themselves, and the second is that, whether in a raft or in the hold of steamer or flat, the log in the round takes up a great deal of room. It is believed that such timber, if squared at its place of origin, would lend itself to transportation in hold, and would become the subject of a remunerative trade. For woods like *sundri* are in good demand. Experts assert that no great mechanical difficulty is presented by the installation in a flat of such a saw-bench as would suffice for the squaring of timber for transport, and that the engine for sawing could also operate a wire hauling tackle for extracting the timber and even a propeller for moving the flat from place to place at an adequate speed. Having regard to the flow of the tides in the Burma creeks, it is believed that a speed of six to seven miles an hour would be sufficient for this purpose.

A mechanical engineer in London has been in correspondence with the Director-General of Commercial Intelligence with regard to the equipment of such a floating sawmill, and has now brought the study to a point at which he is able to specify and quote for a complete plant installed on a suitable barge or flat which might, if desired, be self-propelling. The name and address of the engineer in question may be obtained on application at the office of the Director-General of Commercial Intelligence, 1, Council House Street, Calcutta.

Another industry in which a floating installation might perhaps be employed with advantage is the manufacture of tannin extracts. Crude tanning materials contain only a small proportion of tannin, and freight has to be paid on the greatly preponderating mass of waste material contained in them. In the vicinity of some large tanneries in India, the country has been denuded of tanning materials and the increasing transport charges impose a very serious burden on the industry. India also exports large quantities of crude tanning material; but the rise in sea-freights is restricting this branch of business, and tanneries in Europe resort increasingly to the use of concentrated extracts made where the raw material is produced. The mangrove grows luxuriantly about the creeks in Lower Burma, and there is no very evident reason why it should not be possible to conduct the manufacture of the appropriate extracts by means of a floating plant which could move from place to place as supplies were exhausted. It is, of course, necessary to bear in mind the considerable weight of the vats when full of liquor; and it is possible that such brackishness as is present in the water of some of the creeks might injure the evaporating plant. These points call for expert examination and it is hoped that competent engineers and chemists will interest themselves in the project. The Director-General of Commercial Intelligence will furnish the fullest available information as to the facts involved.

The designing of a floating plant for the destructive distillation of wood presents difficulties peculiar to itself. An article on the subject of the openings for such an industry in India appeared in our issue of 29th February 1912 (page 290).

Proposals have also been mooted for the installation of a baling press for jute upon a flat that could move about the waterways of Bengal; but it is understood that in this matter the mechanical difficulties arising from the need for a horizontal press are secondary to the reluctance of businessmen to accept pressed bales about the nature of whose content they have had no opportunity of satisfying themselves.—[*The Indian Trades Journal.*]

ELECTRICAL WOOD-SEASONING.

A novel electrical method of treating timber is said to have given striking results in France, and to have changed the greenest wood into perfectly seasoned material. A water-tight tank of suitable size is required. The timber is piled on a large lead plate at the bottom until the tank is full, when a second lead plate is placed on top of the pile and connected to the negative pole of a dynamo, the bottom plate being connected to the positive pole. The space around the timber is then filled with a solution containing 5 per cent of resin, 10 per cent of borax, and a trace of carbonate of soda. On turning on the current, it passes from plate to plate through the wood, driving out the sap, and the resin and borax takes its place in the cells and interstices. This process being completed, the timber is taken out and dried when it is ready for use.—[*Capital.*]

WHITE-ANTS.

The damage done by white-ants in India yearly is said to run into untold lakhs of rupees. The bulk of this damage is done under ground to growing crops, and no way has yet been found of successfully coping with it; though something can be done to prevent timber, railway sleepers and so on from being destroyed. It is, therefore, instructive to see that experiments recently carried out in Australia go to show that white-ants may be driven away by the use of German potash (kainit). In the antipodes the ubiquitous white-ant has developed a special weakness for fruit trees

and the Australians have ascertained that if three to four pounds of kainit per large tree are mixed with the soil and spread about the roots, the ant promptly leaves that tree in search of a more nviting locality. A powerful factor in connection with this treatment is that kainit is not only useful in warding off attacks of white-ants, but is a valuable manure in addition ; so, by using it, farmers and orchardists kill two birds with one stone. As we have said, the white-ant admittedly holds sway in the agricultural tracts of India, and it is to be hoped that kainit has come at last to dethrone it.—[*Capital.*]

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EXTENSION OF FORESTRY IN THE UNITED PROVINCES.

RESOLUTION.

Forest Department.

Dated Naini Tal, the 26th August 1912.

OBSERVATIONS.—The attention of the Lieutenant-Governor has for some time been directed to the importance for the future development of the province of a defined policy in the matter of the preservation of the wooded areas now in existence, the *reboisement* of areas which have been denuded of their trees and the establishment throughout the province of well-distributed fuel and fodder reserves.

2. The important bearing of afforestation on the economic problems of the country is not a recent discovery. The first impulse came from Sir Dietrich Brandis, who in 1873 was already advocating the establishment of the " agricultural forest " and had initiated steps towards the realization of this policy in Ajmer-Merwara. And at the close of his official career it was on his

advice that the Madras Government associated the Forest Department so closely with the development of agriculture. The importance of the question was recognised in the report of the Famine Commissioners of 1880 and in the resolution of the Government of India of March 1883 dealing with that report, which called attention to the rapid diminution of grazing lands and wooded tracts in the United Provinces and to the damage resulting from indiscriminate grazing. It was pointed out that thousands of cattle had been saved by the protected grazing of Banda and that thousands had perished in Jhansi for lack of such protection. Inquiries were suggested as to the practicability of the formation of fodder and fuel reserves. It was ascertained that *usar* land was available in abundance and ravine land in considerable quantities. An outcome of these investigations was the ravine experiments in Etawah and Jhansi and the establishment of canal plantations at Cawnpore, Agra, Roorkee and other places in the province. In Madras the fact that the State is the owner of waste land and that, owing to the physical character of the country, cultivated land and forest are brought into more constant and intimate contact, rendered the policy of summoning forestry to the aid of agriculture easier of realisation.

3. But the value of afforestation as providing fuel and forest reserves found its clearest and most forcible exposition in the treatise of Dr. Voelcker, the Agricultural Chemist, deputed in 1890 by the Royal Agricultural Society to report on the possibilities of improvement in Indian agriculture. The formation of fuel and fodder reserves is advocated by Dr Voelcker as by far the most important of all his recommendations. In one passage he speaks of this as the "one practical measure which calls for the most urgent attention and from which the greatest benefits may be expected to follow." His other recommendations and suggestions he considered of secondary importance compared with this. He pointed out that the two great needs of the cultivator are water and manure. His inquiries showed that the good cultivator will never burn his manure when he can get wood. The export of both crops and manure must tend to the eventual

deterioration of the land. The first result of famine is the depletion of the cattle and the further diminution of the manure available. Manure is as essential as water as a safeguard against famine. It ought to be possible by the provision of fuel and fodder reserves to restore the manure to the land and by a resultant increase in cattle food to augment the number of cattle, setting free still further supplies of manure—an endless chain of benefaction. Such a policy would further tend to check the rising cost of cattle power, a factor which at present bids fair to profoundly modify the conditions of agricultural development.

4. These principles are in their generalised and abstract form indisputable : it is in their application to practice that difficulties arise. Obstacles to the prosecution of a policy of creating fuel and fodder reserves present themselves in connection with acquisition of land and the disinclination of the landholder or the tenant to realise the benefit of postponing his immediate advantage to the interest of his posterity. There is a danger that the constitution of forest reserves may involve the harbouring and multiplication of wild animals which ravage surrounding cultivation and a further obstacle has presented itself in the necessity for replacing the grazing areas curtailed during the establishment of such afforested areas. Such restriction is liable, unless alternative grazing areas are made available, to react unfavourably on cattle-breeding. Inquiries tended to show that while the cultivator will burn wood in preference to manure so long as free wood is available, it is very doubtful if he will do so when the use of wood means an appreciable sacrifice in money. While admitting the existence of a host of practical difficulties to be encountered in carrying into effect a general scheme of *reboisement*, the Lieutenant-Governor remains unconvinced that these difficulties are insurmountable, or that they should deter the Government from attacking the problem or from making a survey of the possibilities of an advance along the lines of least resistance. There are many areas of waste land in the province where the establishment of forest cannot affect the interests of high farming or cattle-breeding, and where the main result of such establishment would be to

transform tracts which are barren and useless into productive and protective ones.

5. Apart from the direct benefits conferred by wooded areas in the provision of fodder and fuel, their general effects on the countryside cannot be ignored. Although data are not yet available in India whence it can be demonstrated that forests increase the total rainfall, it would appear probable from the investigations undertaken in those countries where the effects of forests have long been observed that they do so operate. It is beyond question that by the diffusion of cooled air they induce a more evenly distributed and extended precipitation and mitigate the severity of the climate. Their influence on the water-supply of a tract is equally important. The forests regulate the water in the soil and the moisture in the air by retarding evaporation and by retaining rain in the vegetation and sub-soil to find its way without erosion into the nearest stream. They accordingly improve the irrigation of a tract by causing an equable flow in rivers and water-courses and by preventing floods which may devastate cultivation and which rob the country of valuable soil.

6. There are undoubtedly considerable expanses of the land now yielding a bare sustenance to a few cattle which might be transformed into valuable reserves: and it would perhaps not stretch the imagination unduly to conceive a future in which enlightened local bodies should undertake the establishment of such plantations and from them derive and diffuse much benefit. There are in Europe towns and villages which not only draw from their communal forests a revenue sufficient to cover all rates and taxes but obtain a surplus for division among their inhabitants. It is not impossible that afforestation may prove the most practicable method of restoring fertility to an exhausted soil, and that the agricultural future of the plains may lie in their approach to an ultimate ideal of the rotation of forest and cultivation.

7. Tree plantations may often have a direct commercial value distinct from the normal income accruing from the sale of wood and fodder. The Fisher forest at Etawah is an instance in point, and forms an excellent example of the successful and profitable

conversion of barren ravine land into a plantation, valuable alike to its owners and to the town it adjoins. In 1884 Mr. Fisher, then Collector of Etawah, arranged with nineteen zamindars for the reclamation as a fuel and fodder reserve of a tract of nearly 3,000 acres close to the town ; of this tract six-sevenths consisted of barren waste largely intersected by ravines. The proprietors were to provide funds for enclosure, the management was to remain in the hands of the Collector and the profits accruing from the sale of grass and fuel were to be distributed *pro rata* among the co-sharers. Grazing was to be excluded, trees, and in particular the babul, to be sown and embankments to be thrown across the ravines. The cost of fencing plantation and sowing was about Rs. 1,100 and was paid by the zamindars. The Collector spent Rs. 675 in raising embankments. Up to the year 1892 the average annual income from the plantation was Rs. 650. By that year all expenses had been paid off and the zamindars had received Rs. 275 in profits. The timber was then though very young already worth more than Rs. 1,000 and the lease for the cutting of grass and collection of dry wood sold for Rs. 900 yearly. It had not then become possible to allow grazing. In 1902 the zamindars, with the Collector's consent, leased the forest to Messrs. Cooper, Allen and Co. for fifty years at a yearly rental of Rs. 1,416 and a cash payment for fixtures of Rs. 5,000. Under the terms of the lease a third of the area was to remain open for grazing. This instructive and successful experiment thus passed out of the hands of the local authorities and landholders, who have no longer a direct interest in its success. It has since been exploited by Messrs. Cooper, Allen and Co. for the extraction of babul bark for tanning purposes. It still, however, provides grazing and cheap fuel to the town of Etawah and is said to have mitigated the severity of its climate.

8. With a similarly dual object, agricultural and economical, the Lieutenant-Governor has recently devoted Rs. 70,000 to the acquisition of babul-growing areas in the Hamirpur district. These plantations are intended, on the one hand, to preserve and make available to the tanning industry, the supplies of babul bark essential to its existence and incidentally to derive from that industry

an adequate income, and on the other hand to serve the interests of the land itself by preventing denudation and erosion, by arresting the cutting-back of ravines and by providing reserves of fodder and fuel. There is so much good land for babul plantations in the Hamirpur district outside the ravine area that it has been determined to postpone extension of this process to the ravine land of that district till funds are available and till the Kalpi experiment has given more definite results.

9. The Kalpi enterprise also owes its inception to the anxiety awakened in the tanning industry by the prospect of diminishing supplies and rising prices in the case of babul bark. In 1901, at the instance of the Army Department and in the interests of the Government Harness and Saddlery Factory, Mr. Hobart Hampden, Deputy Conservator of Forests, was deputed to investigate the problem of growing the babul for the sake of its bark. His report, while accepting the conclusion reached by the provincial Agricultural Department as to the impracticability of babul-growing in *usar* land, advocated experiments in ravine land and outlined an extensive scheme. In 1904 it was decided by the Army Department to initiate an experiment near Kalpi under the superintendence of the Forest Department. Eight hundred and seven acres of ravine land were taken up, ravines were dammed and babul sown. A recent inspection has shown that the early sowings have established themselves, the later sowings promise well, there is a vigorous crop of young plants from one to eight years old and the whole area will in another year be fully stocked. The plantation should be ready for felling by 1920 at the latest, when about 10,000 trees should be yearly available. It is anticipated that the experiment may prove financially self-supporting, but in this connection it must be recognised that the Kalpi undertaking was a pure experiment and lacked the guidance of previous results, and also that its object was the production of babul bark and not the afforestation of ravines, for which purpose there are other species besides the babul whose propagation presents less difficulty. The sowings had also to contend, in the frost of 1905 and the droughts of 1906 and 1907, with seasons abnormally unpropitious.

The experiment has in any case been valuable in indications, which will save future expense, and the Lieutenant-Governor is assured that it goes far towards proving that the afforestation of ravines is quite practicable and in all probability remunerative.

10. A most interesting experiment has also been undertaken at Thapal in the Saharanpur district by an enlightened landholder, Rai Manohar Lal Bahadur. His estate of 771 acres is situated in the Saharanpur district near the foot of the Siwalik hills and only about a mile from the reserved forests. It contains 103 acres of cultivation and about an equal amount of waste land, the remaining area being covered by poor miscellaneous forest. The soil outside the cultivated area is exceedingly poor and would have been of little value to the owner had he not adopted the wise plan of carefully preserving and fostering the existing growth and making plantations where no such growth existed. Prior to 1892 no attention was paid to the forest area. From 1892 to 1901 only very limited protection was extended to it and no definite method of treatment had been decided on. In 1901 advice was obtained from the Forest department and the miscellaneous forest area has since then been protected from browsing animals and has been worked under the system of coppice with standards, and large blanks of waste land have been planted with bamboos, shisham, eucalyptus and other trees. Altogether between 1901 and 1907 an area of about 73 acres was successfully brought under shisham. In 1908, at the request of the owner, the Forest Department drew up a working plan for the estate, and this is of particular interest as being the first attempt in these Provinces to systematise the working of a private forest. The working-plan estimated that after eight or ten years the average annual receipts would amount to Rs. 5,650 and expenditure to Rs. 3,250 or an average surplus of Rs. 2,400 and this forecast seems to be in a fair way to fulfilment. During the six years previous to the introduction of the working-plan the annual expenditure (incurred chiefly on planting work) had exceeded the revenue. This shows that the proprietor fully realised from the first that, in order eventually to realise the maximum interest on his waste land, he must first create

his forest capital. The resulting young forest is now in a flourishing condition and is under the supervision of a trained staff consisting of a deputy ranger and two guards. The owner will now have the satisfaction of reaping substantial returns from areas which would otherwise have remained unproductive waste.

11. The Forest department in the initial stages of its development was primarily a commercial department and concerned with the production of large timber; its interests were inevitably antagonistic to agriculture in that intense management demanded the exclusion of cattle-grazing. But since the time of Sir Dietrich Brandis it has been recognized with increasing clearness that forestry has a vocation no less important as the handmaid of agriculture, and that she is called to come down from the hills. Big timber need not, as Sir Dietrich Brandis urged in 1883, be the only or even the main object of a forester's existence. Among the peasants' greatest needs are firewood to replace manure, small timber for houses and wood for implements, as well as grazing or fodder for his cattle. There is therefore a place for a branch of forestry in which these commodities, regarded by the commercial forester as accessories, become the main considerations of his craft.

The Tikri forest in Gonda affords an example of the successful administration of such an area worked almost entirely for the production of fuel, both as a revenue-earning undertaking and as a valuable factor in the economy of a district. This forest now constitutes the only extensive wooded tract in a large area of high cultivation; it came under management in 1879-80. In the twelve years succeeding its reservation the total expenditure on the forest amounted to Rs. 26,750 and profits to Rs. 26,900—a ratio of over 100 per cent on expenditure. In the ten years from 1891 to 1901 the gross income of the forest was Rs. 1,22,600, the gross expenditure Rs. 68,000, and profits Rs. 54,600, or about 80 per cent on the expenditure. The average yearly profits were Rs. 5,460. Since then profits have risen substantially, reaching in the year 1902 the large figure of Rs. 17,260, while working expenses have averaged about Rs. 4,600. The produce of the forest is almost entirely fuel and grass, the former being bought in considerable

quantities by the railway. In 1902, at the time of settlement, the Government received information that the ravages of wild animals and cattle harboured in the Tikri forest had effected a material deterioration in surrounding cultivation, and the local authorities were asked to consider the desirability of disforestation. The Settlement Officer urged that, while it was a fact that deterioration had occurred from this cause and from the effects of the forest on drinking water, the value of the forest as a grazing reserve and fuel producer was so great as to render its abandonment a step of doubtful wisdom. He pointed out that wood for fuel, implements and house-building was 25 per cent cheaper in Gonda than in the trans-Gogra districts, and that this price could not be maintained if wood had to be brought from submontane tracts; he suggested that deterioration could be largely arrested by the organised destruction of wild animals, and urged that forests standing in a highly cultivated area required different treatment in this respect to forest surrounded by wild tracts. He admitted that some direct advantage to the revenue would result from the forest being brought under cultivation, estimating that in twenty-five years the revenue assessed would amount to Rs. 10,620. Systematic action was taken to reduce the wild cattle and other animals harboured, the deterioration in surrounding cultivation complained of seems to have disappeared and the idea of disforestation has been abandoned A further examination of the financial aspect of the matter produced a forecast from the Divisional Forest Officer which would show that in twenty-five years the revenue accruing from the forest will amount to over Rs. 20,000, a sum about double that anticipated from assessment to land revenue.

An extension of agricultural forestry on these lines might go far to remove the distrust of the department which has prevailed among the cultivating population by the addition of a visible policy of giving to the inevitable policy of taking away.

12. Such a development has, the Lieutenant-Governor recognises, been hitherto impracticable, owing to the inadequacy of the existing staff, an increase in which had to be justified by pointing to an increase in revenue, and owing to their necessary concentra-

tion on the settling and management of the extensive reserved forests of the province. Sir John Hewett is, however, convinced that a stage has now been reached in the economic development of the province when a systematic examination of the possibilities of afforestation is imperative. The fuel and fodder reserves at present in existence constitute an insignificant proportion of the provincial area. The whole area of reserved forest is at present about 4 per cent of the total area; the addition of the Kumaun "protected" forests will raise the proportion to 6 or 7 per cent. Of this reserve much is necessarily not available for fodder or fuel purposes. It is, moreover, largely concentrated in certain areas, and extensive tracts are situated at such a distance from the forests that the latter cannot serve as fuel or fodder reserves for them. With the agricultural and industrial development of the province a rapidly expanding demand for forest produce, and in particular for fuel, small timber and grass, must be anticipated. For the future economic progress of the people the Lieutenant-Governor believes it essential that action should be undertaken to provide well-distributed areas for the production of these commodities. Such action will prove increasingly difficult to initiate as agriculture and industries expand. Systematic action is at the present juncture even more urgently demanded to prevent the progressive reduction of the restricted area remaining under forest—a process which without State interference must operate with increasing rapidity. The disappearance even of private forests threatens to jeopardise the existence of the reserved forests since it tends to throw upon the latter a burden in providing grazing which they cannot hope to support. Moreover, the increasing pressure of population and cultivation upon existing reserves bids fair at no distant date to react with destructive effect on the cattle-supply of the province and, through the cattle, directly on its general agricultural prosperity. It involves, moreover, a disastrous rise in the price of timber such as is at the present moment apprehended in Europe, an apprehension which has in England lent stimulus to a national afforestation movement. In view of the demonstrable contraction of fuel supplies in the plains of the province and with the experience of the Punjab before

him, Sir John Hewett regards the need for definite action as imperative.

13. Afforestation is, however, a branch of forestry which differs widely from the management of existing forests, and it is a branch in which the officers of the Forest Department have as yet had little experience. The Lieutenant-Governor therefore considers it essential that, before a definite scheme of afforestation is embarked on, a systematic survey of the available areas should be undertaken and that this survey should be combined with a series of experiments on various classes of waste land with a view to determining the best methods of dealing with different soils, the species best adapted to various conditions and the cheapest and most efficient methods of propagation. It will not always be necessary to contemplate acquisition. It may prove possible to arrange with owners or communities that they should allow the Government to afforest their land in return for profits or a portion of profits.

The policy thus adumbrated may eventually necessitate the creation of an afforestation branch of the department, but the Lieutenant-Governor wishes it to be clearly understood that, even with such a development, the *rôle* of the department is not to manage the forests which local bodies or zamindars might establish, but to advise the owners in the methods of management, and to give them any assistance which they might ask. For the purposes of the present survey His Honour considers that the deputation of a single imperial officer with a small staff will meet the situation. The Lieutenant-Governor has decided to depute Mr. E. A. Courthope, Deputy Conservator, to the work. Mr. Courthope has (under the advice of the Director of Indian Forest Studies and of Sir William Schlich) undertaken a two months' tour in Europe with a view to studying examples of afforestation practice. Sir John Hewett regards his appointment as the first step in an undertaking which may prove of incalculable advantage to the province.

AN ACCOUNT OF A PORTABLE SAW MILL IN THE NORTH KANARA FOREST DIVISION, BOMBAY.

DETAILS OF ENGINE.

The engine is a 12 N. H. P., portable, by Clayton and Shuttleworth of Lincoln. The cylinder bore is 12″ diameter with piston stroke 16″.

The boiler pressure is 80 lbs. per square inch.

The fly-wheel is 5½′ diameter working at 50 to 60 revolutions per minute.

It drives two 42″ circular saws, and one small circular saw and a 2″ band saw for cutting up waste material.

CHANGING SITE.

The mill is readily transported from place to place. It can be moved and set up in ten days, and in one season, 1902-03, the site was changed no less than three times. The main item of expenditure is the cost of carting the pieces to the mill and the lead should not be more than 4 miles, hence the necessity for frequently changing the site.

The average annual outturn for a period of six years (from 1899 to 1904) was 44,099 M.G. sleepers. During the period 1905 to 1910 the mill was not moved about sufficiently, pieces were brought from distances up to 8 miles, and the average outturn fell to 24,752. The contractors were losing money on material brought in from beyond 4 miles, consequently they failed again and again to bring in the required quanity, and finally no contractor would touch the work.

A programme is now drawn up showing the proposed positions of the mill for five years ahead, and material is being collected at these depôts. In North Kanara where labour is difficult to obtain, and contractors quite unreliable, arrangements must be made to commence collecting material at least two years ahead.

SUITABLE CLASS OF MATERIAL TO WORK ON.

The minimum girth of the exploitable teak tree in North Kanara is 7′. Almost every tree is more or less buttressed near the foot and many have suffered from fire.

Up to the year 1904 the saw mill was cutting 'Jamba' (*Xylia dolabriformis*) and for years all the hollow irregularly-shaped ends of the teak trees had been cut off and left to rot or burn in the forests. These hollow ends 3, 4, 5 and 6 feet in length were to be seen everywhere. Now the unsound end pieces are sawn off to give 6 and 7 feet sleepers. Quite 50 per cent. of these sleeper pieces would not repay the cost of bringing out to the sale depôts in the log. Many of the pieces will not yield even one M.G. sleeper, but every piece is brought in and cut up even if it will not yield anything better than logs (battens for cotton and cloth bales) measuring $2\frac{1}{2}'$ to $3' \times 2'' \times \frac{1}{2}''$ or $2\frac{1}{2}' \times 1'' \times \frac{3}{4}''$.

It seldom pays to cut up good sound logs, and saw mills in these forests should be restricted to cutting up short, unsound material not over railway sleeper length.

In 1899, 8228·16 cubic feet of good squared teak logs were cut at the mill for scantlings, the yield was—

	4352·57 cubic feet of scantlings at Rs. 3 per cubic foot, value	Rs. 13,057·71
of which	296·33 cubic feet rejected at Rs. 2, value	Rs. 592·66
	4648·90 cubic feet.	Total value Rs. 13,650·37

The timber in the rough log was worth Rs. 13,165 and the cost of sawing, etc., was Rs. 713, so that it did not pay to cut up these logs.

On the other hand, in 1902—in the Kirwatti Depôt, 800 tons of very short, crooked hollow teak logs, from which all the better logs had been selected, were cut into sleepers and small scantlings, with the result that the sawn material gave a much better return than if sold in log.

The material supplied to the mill should be restricted to unsound bottom-pieces and small top-pieces and branchwood.

QUANTITY OF MATERIAL REQUIRED.

The number of sleeper pieces required to keep the two circular benches working throughout the year, yielding 50,000 M.G. sleepers, varies much.

At present the mill is in rather poor teak forests and the average yield per piece would not be quite 2 sleepers.

The number of teak trees to be felled is laid down in the working plans, and is approximately equal year by year. The average outturn per tree, however, varies much in different fellings, from $37\frac{1}{2}$ cubic feet of squared log and 12 M.G. sleepers to 20 cubic feet and 5 M.G. sleepers. Usually provision is made to supply 25,000 pieces annually.

THE OUTTURN AND EXPENDITURE.

The saw mill commenced working in 1897. The outturn increased steadily from 35,000 Jamba sleepers in 1897-98 to 52,000 in 1900-01. The pay of the staff and mill-hands rose during this period from Rs. 4,579 to Rs. 5,941.

The actual outturn and expenditure for the past year 1911-12 is given on the next page.

GOVERNMENT SAW MILL AT SINGATGERI.

Outturn and Expenditure for the year 1911-12.

Details.	Outturn. Number.	Outturn. Cubic feet.	Outturn. Value of outturn.	Proportion of value of outturn which may be credited to Mill.	Expenditure.	Net saving over hand-sawing.	Remarks.
			Rs	Rs.	Rs. a. p.	Rs. a. p	
Teak sleepers 7′ ...	458	1,002	1,832	35,684½ at 12 annas	...	...	A contractor would not supply sleepers from these forests at less than 12 annas.
,, ,, 6′ ...	51,369	77,053	*1,11,369				
Bridge sleepers ...	716	1,432	3,580				
Terminalia tomentosa sleepers.	173	260	*Nil.*	*Nil.*			40,000 at 12 annas = Rs. 30,000.
Teak scantlings ...	...	768·66 at Rs. 2 per c. ft.	1,537	1,537			11,369 at 8 annas = Rs. 5,684½
Boards	...	337·7 at Rs. 2½ per c. ft.	844	844			35,684½
Battens 6′ ...	...	5,756 at Rs. 1½ per c. ft.	8,634	8,634			

*Out of 51,369 sleepers 40,000 passed sleepers ... value Rs. 1,00,000
11,369 rejected sleepers ... value ,, 11,369
1,11,369

Many of these sleepers have not been inspected and the number finally passed may be nearer 45,000 than 40,000.

GOVERNMENT SAW MILL AT SINGATGERI—*(concld.)*

Outturn and Expenditure for the year 1911-12

Details.	Outturn.			Proportion of value of outturn which may be credited to Mill.	Expenditure.	Ne saving over hand-sawing.	Remarks.
	Number.	Cubic feet.	Value of outturn.				
				Rs.	Rs. a. p.	Rs. a. p.	
Battens 3′	...	43 at Rs. 1¼ per c. ft.	54	54			All the scantlings, battens, etc., are cut from waste which would be left behind in hand-sawing.
Felloes	188	...	94	94			
Slabs	About 22,000 c.ft. stacked		500	500			
Current expenditure of Mill including pay of foreman, clerk, mill hands, oil, repairs, etc.		...	...	...	8,034 10 5		For details of expenditure see overleaf.
Carting to Tavargatti 52,716 sleepers at one anna and 6,905 c.ft. of sawn material at Rs. 4 per 100 c. ft.		...	...	...	3,571 0 0		
Preparing and bringing 30,405 pieces to Depôt at 8 annas.		...	...	...	15,202 8 0		
Interest on cost of machinery at 3 per cent. on Rs. 10,929.		...	...	...	382 8 0		
Depreciation 5 per cent. for replacing machinery after 20 years.		...	...	...	546 0 0		The engine is 15 years old.
			1,28,444	47,347½	27,736 10 5	19,610 13 7	

In hand-sawing the outside slabs and hollow wood, which will not yield a sleeper, are wasted and left in the forest.

At the mill the yield of material cut from this waste material covers all sawing expenses and cost of machinery.

To compare the work of this saw mill with hand-sawing, deduct the cost of collecting and bringing the pieces to the mill, *viz.*, Rs.15,202 from the sum which we should have to pay contractors for sawing and collecting the sleepers Rs. 35,684, this gives Rs. 20,482 approximately the monetary advantage of machinery over cooly labour.

The engine which has been working for fifteen years required new parts and the current expenditure, the details of which are given below. Rupees 8,626 is exceptionally high.

Expenditure of saw Mill from 1st July 1911 to 30th June 1912:—

Wages of Foreman, Clerk, Mill-hands.	Repairs to machinery and new parts.	Oil, rosin, ropes, waste, etc.	Fuel preparing and carting to Mill.	Miscellaneous and unusual.
Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
6,694 13 5	New brackets bushes, braces, centres, etc., Rs. 366-8-0.	Leather (skins). 47 6 0	592 4 0	Stationery 20 10 0
				Inspector's fee. 15 0 0
		Manilla ropes 68 15 0		Removal of stores from Mynol. 40 0 0
		Coir ... 57 6 0		Hutting repairs. 158 8 0
		Vacuum oil 256 2 0		
		Cocoanut oil 133 10 0		Digging well. 156 8 0
		Kerosine oil 15 0 0		
		Baskets ... 2 0 0		
		Chalk ... 2 4 0		
6,694 13 5	366 8 0	582 11 0	592 4 0	390 10 0

Total Expenditure ... Rs. 8,626-14-5.

For the first five years of working, the working expenses averaged Rs. 5,000.

Cooly labour is difficult to obtain at 8 annas a day.

THE ADVANTAGES OF A SAW MILL.

The advantages of a machine over handsawing in Kanara are obvious.

In the first place with teak there is a saving of at least 6 annas per sleeper. This is derived from the saving of material, all the mill-waste being easily converted into marketable battens, etc.

While working on *Xylia* the advantages of the mill were not so great. No use could be found for the waste material and the cost per sleeper including transport to railway, 40 miles, worked out as under :—

In 1897-98 (only 2% rejected)
the cost per sleeper was—Annas 5·13 for bringing in pieces.
„ 2·26 current expenditure of mill.
„ 4·41 carting to Hubli, 40 miles.

11·8

In 1898-99 (18·4% rejected) cost per sleeper was annas 14 pies 5·8
In 1899-00 „ „ „ „ „ 12 „ 1·7
In 1900-01 „ „ „ „ „ 11 „ 5·4

Average—annas 12 pies 5.

This is about 2 to 3 annas below the contract rate with hand-sawing.

With the machinery the outturn is steady and more reliable than contractors' work, the sleepers too are better cut. Sufficient hand-sawyers are not available.

DISPOSAL OF WASTE MATERIAL.

To convert the waste material a small wooden bench, which takes the old circular saws worn too small for the sleeper-cutting benches, has been constructed. Also a small band saw taking a band about 2" wide, has been purchased for cutting curved wood for cart-wheel felloes.

The waste material converted consists of—

Rejected Teak sleepers	...	worth Re. 1 each.
Teak scantlings, 4′ to 6′ long suitable for window frames, etc.		worth Rs. 2 per cubic foot.
Battens 6′ × 2″ × 1″	...	worth Rs. 22 per 1,000 running feet or Rs. 80 per ton.
„ 6′ × 1½″ × 1″	...	worth Rs. 15 per 1,000, running feet or Rs. 72 per ton.
„ 6′ × 2″ × ½″	...	worth Rs. 10 per 1,000 running feet or Rs. 72 per ton.
Boards ½″ to 1″ thick	...	worth Rs. 2-8-0 per c.ft.
Lags, battens for cotton and cloth bales 2½′ to 3′ long × 2″ × ½″ or by 1″ × ¾″		worth Rs. 2-4-0 per 100 lags.
Cart-wheel felloes cut from bent pieces about 2¾′ long, depth 7″		worth annas 8 each or Rs. 6 per set of twelve for a pair of wheels.
Teak spokes, 2½′ × 3½″ × 1⅝″	...	worth Rs. 3 per set of 24.
Small felloes, depth 5″	...	worth annas 5 pies 4 each or Rs. 4 per set of twelve.

The cost of cutting waste wood is trifling. As stated above, the bench is of wood and made in the mill, the saws, etc., are the old worn-out material from the sleeper saw benches.

For handling the waste material and working the bench, the following coolies are required :—

1 sawyer	at	12	annas	a day	Rs. 2-2-0.
1 benchman	„	6	„	„	
3 boys	„	3	„	„	
2 women	„	3½	„	„	

The daily outturn is 26 cubic feet of battens and the cost per 1,000 running feet is Re. 0-9-2 for cutting and 4 annas carting.

The 6′ battens are turned out at a cost of Re. 0-5-6 per 100 and the 3′ battens at Re. 0-2-9.

W. E. COPLESTON.

GLOWING WOOD.

The deterioration of vegetable matter gives off phosphorus which causes flashes of light often seen in marshes and damp places. No wood has, however, been heard of that is always glowing.

Last week à piece of wood was seen shining brilliantly in the forest and the light was of the same nature as that emitted by glowworms, the difference being that all the exposed surface of the heartwood was glowing ; portions where the heartwood was covered with sapwood or bark were dark.

Next morning on inspecting the spot the wood was found to be a piece of the root of *Pinus excelsa*, about an inch in diameter, thrown aside, in making a road, leading to a rest-house, a little way up the hill. A large number of similar roots was collected and at night one more piece was found with a similar effect ; none of the other roots, green, dry or rotting, exhibited any signs of light except the two pieces mentioned above. All heartwood exposed by chipping the bark off, glows brilliantly and the pieces of heartwood cut off in chipping, look like lucifer match sticks, rubbed and scattered all over the floor. It was found that the wood as it dries loses the property of glowing and when moistened sometimes resumes its lustre.

The pieces are in a deteriorating condition and it is likely that the glowing is due to the emission of phosphorus, but such has never been seen before. The belief of the local people is that the glowing is due to the contact of certain herbs, which glow at night, but no such herb has so far been seen, either on the spot or anywhere else as far as is known.

A piece has been sent to the President of the Imperial Forest Research Institutes and if it keeps glowing till it reaches the destination we might hear about it again.

S. N. KOUL,
Kashmir Forest Service.

CORRESPONDENCE.

TO THE HONORARY EDITOR, INDIAN FORESTER.

FOREST LOANS.

SIR,—The suggestion of loans for the development of forests appears to me rather before its time considering the present state of Indian forest policy. The contributor of an article under the above heading to the *Indian Forester* of July admits this policy is open to question as regards its financial justification. And, though the Forest Department may be a quasi-commercial department, this does not seem to call for the consideration of the refinements of commercial enterprise before the commercial foundations of Indian forestry have been examined.

Under the present system of management all expenditure, whether for the working or the development of the forests, is incurred out of revenue. The contributor of the article to which I refer objects to the development of forests in this way out of revenue on the score that Government is not now obtaining all the revenue it has a right to, while Governments of the future will have the benefits accruing from increased capital. That is true, but the case is hardly analogous to that of the ordinary commercial company, the shareholders in which have a claim to the earnings of the capital they have provided. The life of Government is longer than that of an ordinary shareholder, and it has to consider the future of its undertakings to an even greater degree than the most conservatively managed commercial company.

Even commercial companies, however, constantly do apply a small part of their earnings to the development of their property. And, although generally in such cases the benefits expected are capable of more immediate realisation than in the case of the development of forest property, yet Government can also afford to wait longer. Again it is at least doubtful whether the amount of revenue re-invested in Indian forests is out of proportion to the revenue itself.

Now the development of forest property may be of one of two classes: Firstly, the improvement of the growing stock; secondly, the provision of better means for disposal of the forest produce. The benefit of the latter class of development is more or less immediately realised while that of the former is generally long deferred. In consequence the extent of benefits accruing from improvements in means of disposal is more easily calculated.

These two classes of capital expenditure on development seem to me to need quite separate consideration. No Government is likely to refuse sanction to expenditure which can be shown to produce reasonable profit in the course of a few years, while the provision for such expenditure out of revenue has the following real advantage and disadvantage. The success of forest management is unfortunately judged by most laymen and many Forest Officers by the surplus, or excess of revenue over expenditure. Consequently a Divisional Forest Officer is not inclined to spend much time, which he can generally ill spare, in working out propositions, the profit of which is not at once apparent, or, the expenditure on which will perhaps only reduce the measure of his successful management for all or most of the time he can expect to be in charge. This no doubt accounts for many opportunities of deriving increased profit being lost. On the other hand, Government has a guarantee that only schemes showing the very greatest immediate profit will be put before it.

The remedy for this premium on stagnation in method of working is not difficult. A separate capital account should be kept and Government's guarantee should take the form of expert scrutiny of the finance of any new proposition.

It may be urged that forest accounts in India are already sufficiently complicated. Indeed they are so: beyond all practical use to which they are put this gives good reason to suppose they could be simplified to more than counterbalance any additional labour involved in keeping separate capital accounts. Given such classification of expenditure, to finance a project by loan would only be a complication which must lead to delay, if indeed a loan could be raised on suitable terms. In this connection it must be

remembered that a loan on forest property can often only be secured on the value of the land which is generally low. The value of the growing stock, though it may be great, is so easily affected by the treatment it receives and dangers to which it is exposed ; again it is a value which is not readily realisable.

In the case of expenditure on the creation of forests, or the improvement of the growing stock of existing forests, the solution is not so easy. It may be laudable to provide firewood and timber where these are scarce, and so perhaps also benefit agriculture indirectly by ensuring the use of cowdung as manure instead of as fuel. The creation of plantations for such purposes may even be so desirable that the policy of Government dictates it without further enquiry as to direct profit. In cases not so extreme it certainly seems necessary that Government should calculate the cost, and consider this in relation to the benefits derived, as much as would be done in any purely commercial concern. Indeed even where circumstances justify neglect of direct profit, Government might reasonably enquire what the indirect benefits are costing. This whole question of the creation of forests is inseparable from the finance of forestry.

Can Government lend money, say, for the formation of a plantation for purely commercial purposes until convinced the plantation will yield the interest required on the loan? How much less is the open market likely to have anything to do with such a loan until the interest is clearly shown to be forthcoming.

The finance of forestry is however a branch not readily understood by the laymen and requiring constant practice by a Forest Officer if it is to be of practical use to him.

Except in extreme circumstances the case of improvement of the growing stock of existing forests is identical with that of the creation of new forests, but it involves consideration of the financial position of the forest as worked at present. This then surely should be the starting point for all future financial propositions and not forest loans which may afford suitable means for rendering a certain property more profitable.

Now the financial position of a forest depends chiefly on the relation between growing stock and yield. Even in the most intensely managed forest, capital other than growing stock is of comparatively small extent. Should we not then first devote our attention to the major part of the capital and that already existing rather than contemplating the raising of more capital ?

"Conservative management" is the catch phrase of the opponents of all such investigation. It means leaving a forest as you find it so far as the number of mature trees is concerned, putting little or no faith in scientific forestry, and shutting your eyes to the results really achieved. "Conservative management" served its purpose when forestry was in its infancy in India, it protected the forests from excessive lumbering, nowadays it should be of historic interest only.

Now the finance of forestry has several peculiarities. Firstly, the rate of interest on forest capital is low even in favourable circumstances. In other words, deviation from the most favourable form of management may reduce the rate of interest to insignificance. Secondly, time plays an unusually important part in forestry. The period which elapses between the establishment of a crop and its maturity is as a rule very long compared with periods associated with other spheres of human activity. This leads to the fallacy that whether such long periods are a few decades longer or shorter can be of little consequence. In reality a simple calculation shows that with every increase in rotation the capital employed increases very considerably.

It is unnecessary for me to refer further now to the theory of forest finance. The Government forests of India yield at present a surplus of Rs. 1,10,00,000 and it is not unreasonable to assume that the forests alone from which this is derived represent a capital of a hundred crores. Of course the accuracy of this figure cannot be vouched for, but even the roughest estimate makes possible some appreciation of the capital involved. And such appreciation serves its purpose, if it gives cause for reflection on the advisability of adding to this capital without enquiry as to whether the present capital is employed to the best advantage.

My argument is then that the relation of interest to capital should first be examined in individual cases. This examination will, I feel certain, prove that great increase of a forest revenue can be obtained by a re-adjustment of capital. In its turn this re-adjustment will probably liberate much capital and, credited to a separate capital account, seems likely to make the financing of Indian forestry, whether by Government or public loan, quite unnecessary. Such procedure would not be unlike the practice of creating forest reserve funds existing in some European countries where, although there was never a "conservative management" craze, a small surplus of growing stock was kept standing before the funds were started.

In the circumstances what is at present required is not scrutiny of the principle of forest loans, but, as the writer of the article subsequently remarks, a series of well thought-out projects. I quite agree with him that a special Forest Officer, or branch of the department, is required for the purpose with whom, or which, experts would have to be associated as circumstances might require. The average Divisional Forest Officer has already as much to do as he can do efficiently, and I think it is often forgotten how much of his success depends on personal inspection of vast areas in the roughest country.

There is only one other argument and suggestion in which I cannot quite agree with the writer of the article on forest loans. He admits the existing staff of the Forest Department is wholly inadequate, and sees in this the origin and extension of the exploitation of our forests by traders who gain a considerable share of the profits of forestry. Here again he rather looks to loans as a remedy. I think he should first rather have sought the chief cause of the staff being inadequate. Once again it is "conservative management."

This principle of accepting the existing number of mature trees as the minimum desirable applied so long as Indian forests were a property just brought under protection on which the existing demand had to be regulated. As the demand grew, however, there was unfortunately not a modification of this policy in

accordance with principles of economic forestry, but an extension of the original rough and ready rule to more distant forests. This not only meant that the Divisional Forest Officer's duties extended over increasingly large areas, but forests for the produce of which the demand was not great in the past were not, and are not, being worked to their fullest extent or best advantage. The latter consequence is that which has been overlooked. Relief for the Divisional Forest Officer was bound to be found in order that he might be able to carry out his duties with the minimum degree of efficiency required. Judging by expenditure the cheapest form of relief was to sell trees standing. Now, it is apparent to many that this has often been most expensive. But still " conservative management " survives and even the writer of the progressive article on loans does not seem quite proof against its attractions. He seems to look for progress chiefly in opening up difficult localities or in starting new industries. Advance in both directions may reasonably be expected and loans may ultimately be indicated in certain cases, but surely the first well thought-out projects should concern themselves with the finance of the more valuable forests and forest industries now being worked. Demonstration of the possibility of these is likely to carry more conviction than the most hopeful new proposition ; and comparison of present revenue with what might be obtained is likely to establish a better claim to increase of staff than the greatest hopes of a new departure.

In conclusion, I would urge the necessity for the formation of a finance branch of the Forest Department to deal with some of the questions I have endeavoured to set forth, and as a means of determining the directions in which research is likely to be of most immediate profit.

A. D. BLASCHECK, I.F.S.

CASUALTIES IN THE IMPERIAL FOREST SERVICE IN CONNECTION WITH PENSIONS.

SIR,—From time to time there have appeared in the *Indian Forester* letters on the subject of pensions, while it is understood that most officers have submitted memorials on the same subject. One of the grounds believed to have been put forward by many memorialists, has been the alleged high rate of mortality in the Department, and that better pension rules would thus increase the Imperial pensionary list to a comparatively small extent. A member of the old Coopers Hill staff with some experience of India used to say that only 25 per cent of the Europe recruited officers ever lived to draw their full pension. In order to get at the facts, as far as possible, I have been at some pains to examine existing statistics. Men who entered the Department up to the end of 1886 would have been entitled to their full pension at the close of last year, provided that they had not taken furlough to a greater extent than is permitted to count towards pension. I have therefore looked up the record of men, trained in Europe, who entered during the decennial period 1877 to 1886 inclusive, that is to say, I have examined the case of men for a 10-year period who might now be normally enjoying their full pension. The figures are interesting—to the survivors.

The following gives the result of my examination :—

Total number of recruits, 1877 to 1886	49
Left the service within 20 years without pension ...	5
Now drawing a reduced 20 year pension ...	5
Now drawing full pension	5
Dead	20
Still in the service	14

Of the officers who entered during the period I have taken, over 50 per cent are casualties 25 years later, leaving no charge on the Government which they served. To put this somewhat differently. Allowing that the average age of entry was 22, then the average age at the end of last year of those that entered during the decennial period taken, would have been 52 if they had all lived Thus over 50 per cent were casualties before an average age of 52,

imposing no pensionary charge on Government, while 10 per cent more retired on a reduced pension, giving rise to the presumption that their health had given out at between 20 and 25 years' service, say at an average age of 42½ years. I doubt whether this very high casualty has been fully realised either in India or at home. If it had been one would have expected that there would have been some tendency towards liberality in the matter of pensions instead of the reverse, *e.g.*, under article 475 of the C. S. R. the Forest Department is the only department treated worse than others in the matter of special pensions. This invidious exception could hardly have been made had the casualty figures been carefully examined, leaving entirely on one side the apparent inconsistency and inequality of treating on no obvious grounds one department differently to others, a procedure that has given rise to a feeling of bitterness in every way regrettable. The Forest Department is the one department that should receive liberal treatment, both as regards pension and furlough owing to its exceptional casuality rate, and there seems to be no reason why in the interests of the Public Service, it should not have rules of its own, regarding furlough, age of retirement and pension. Holding this view, I am therefore one of those who welcome the advent of the newly appointed Commission to enquire into such matters, and have little doubt that its members will carefully examine existing anomalies and the conditions of service and pension in each Department, quite apart from the question of sterling pensions which is bound to be considered.

S. O.

AFFORESTATION ROUND DELHI.

SIR,—Now that the capital of India is to be Delhi the needs in forest products, more particularly fuel (wood and charcoal) and fodder, of that already vast city will increase very considerably. I would suggest, herefore, that a large forest reserve, under the Forest Departmen , should be formed in the neighbourhood. Although I do not exactly know what the environs of Delhi may be

like it seems to me probable, judging from what I know of the Jumna river lower down, that the banks of that river are likely to provide considerable areas of waste, ravine land—very cheap to acquire. On such land will easily grow babul, various other acacias, neem and other species. Or, the example of Lahore might be followed, and another Changa Manga established. Or, again, both waste land and irrigated plantation might form the reserve. Perhaps in this way something in the nature of timber, besides fuel and fodder, might be grown, though there is less need of this than would ordinarily be the case because of the great quantities of timber (though not fuel) which is floated down from the hills to Delhi.

There would seem to be a great need for such a reserve, and it should pay handsomely, but there is no doubt one great drawback in the fact that its establishment would encourage the increase of animals harmful to the surrounding crops—antelope and pig, also possibly leopards. The pigsticking and shikari community would no doubt welcome this, but it is probable their wishes would have to give way to the needs of the cultivator, and if the reserve were in danger of being vetoed on this same ground I would frankly accept the situation, arm the guards with rifles, and make it a part of their duty to keep down all wild animals. On the other hand birds would be no danger, and the reserve might well become an excellent bird covert, to be reserved, perhaps, for the Viceroy and his guests. Rajahs have their game preserves; why should not the Viceroy have similar amenities?

A. G. HOBART-HAMPDEN.

BRASIER MEMORIAL PRIZE.

SIR,—I have been asked to start the proposal that a memorial should be raised to the late Mr. C. E. Brasier, the Senior Conservator of Forests in the Madras Presidency; and to invite subscriptions not exceeding Rs. 15 from any of his friends, or any person who was interested in him.

It has been suggested that the memorial should take the form, should funds permit, of a yearly prize at the Coimbatore College for the most efficient student on the lines of which the late Mr. Brasier would have most approved.

Mr. F. C. L. Cowley-Brown, Principal of the Forest College, Coimbatore, has kindly consented to act as Honorary Treasurer and Secretary of the Fund; and subscriptions may be sent to the Bank of Madras, Coimbatore, for the "Brasier Fund."

A. W. LUSHINGTON.

29th August 1912.

[The *Indian Forester*, with the approval of the Board of Management, is subscribing Rs. 100 to this Fund.—Hon. Ed.]

"IDENTIFICATIONS OF THE ECONOMIC WOOD OF THE UNITED STATES, INCLUDING A DISCUSSION OF THE STRUCTURAL AND PHYSICAL PROPERTIES OF WOOD."

A very useful manual has recently been published entitled "Identification of the Economic Woods of the United States, including a Discussion of the Structural and Physical Properties of Wood." The author is Mr. Samual J. Record, M.A., M.F., Assistant Professor of Forestry Products, Yale University. The work is divided into two parts and contains vii + 117 pages in 8vo. with illustrations in the text and 7 full-page half-tone plates. Price $ 1·25 or 5s. 6d. net.*

The author opens with an introduction which is well worth reading. It is stated that while the book is primarly intended as a manual for forest students, it is hoped that it will also aid others in the study and identification of woods. The first para. of the introduction strikes a note which applies equally to India and America, namely, that owing to the ever-increasing demand for the better species of timber, those of less value are now finding a market and that there is a tendency amongst unscrupulous persons

* John Willy & Sons, Scientific Publishers, 43 and 45 East 19th Street, New York, and Chapman and Hall, Ltd., London, 1912.

to pass off those of less value for better varieties and hence the necessity of a key to help in the identification of timbers.

Part I deals in detail with the Anatomical Structure and Physical Properties of Wood. In discussing the great natural classes, I Gymnosperms and II Angiosperms, the author excludes Monocotyledons from the second class as relatively unimportant as timber yielding species. This is, we think, to be regretted, as though Monocotyledons cannot be classed as of great and general importance in this respect, they are nevertheless of considerable importance locally, while for a student the study of their peculiar structure is important.

The chapter on Anatomical and Physical Properties is divided into sub-heads of which 21 deal with the Anatomy and 11 deal with the Physical Property of the wood. The subject-matter in these sections of the book is clearly and concisely written and should be easy for the student to follow.

Under the sub-head "Tracheids" is given a table of length for a number of coniferous woods and a similar table is given for the wood-fibres of Dicotyledons. The striking difference in the average length of the Tracheids and wood-fibres is most noticeable, and is a point of some interest. Of 29 sets of figures of the former the maximum average length is found to be 7·00 mm. for *Sequoia sempervirens* and the minimum average 1·95 mm. for *Picea edulis*, while for the latter the maximum average length is 1·90 mm. for *Platanus occidentalis* and *Liriodendron tulipifera* and the minimum average of ·75 mm. for *Acer rubrum*.

Under the sub-head "Rays" are given two fine plates illustrating medullary rays which will give the student a clear idea of their structure, while two plates illustrate resin ducts in conifers. The question of the formation of additional ducts where wounds occur is lightly touched upon, had more been said in this connection it would doubtless have been of value and interest, especially as in America the tapping of pines for resin is such an important economic factor in the working of some of the forests.

The question of the formation of annual rings is well and clearly dealt with and to help the student two good plates are

given on page 42 illustrating sections of *Quercus macrocarpa*, while the frontispiece gives an excellent illustration of a section of a *Quercus alba*.

On pages 50, 51 and 52 is given a table of the specific gravity of 150 species of timber. The figures have been arrived at by weighing the specimens after being oven-dried at a temperature of 100° C. Looking to the systematic way in which the specific gravity of the various timbers has been determined in America, it is to be regretted that more careful attention has not been paid to this subject in India. Our text-books give much data on this point, but though it is presumed that the weighings were carried out with naturally air-dried specimens, it is by no means certain that this was always the case.

Little is said as to the mechanical strength of the various timbers, the point being only lightly touched upon on pages 53 and 54. This is an omission that we should like to see rectified in future editions of this useful publication, as after dealing with the weight, water content, shrinkage, warping, checking, hygroscopicity, etc., of timber, its strength to withstand tension, transverse strain, shearing and compression, especially with reference to the moisture in the timber, should naturally find a place. Part I ends with a useful list of publications dealing with the Physical and Technical Properties of timber.

Part II is a key to the Economic Woods dealt with in Part I. This chapter is divided into two parts, *i.e.*, I, Homogeneous or Non-porous wood; Gymnosperms; Conifers: "Soft Woods," and II, Heterogeneous or Porous woods: Dicotyledons; Broad-leaf; Hard-woods. We are not sure that we like the wooding—"Non-porous" and "Porous woods," it is somewhat confusing. The first section is further divided into—A, Wood with resin ducts, both vertical and horizontal, rays with tracheids, and B, Resin ducts normally absent; sometimes present as a result of injury, the vertical ducts arranged tangentially in a compact row. Ray tracheids present or absent. The second section is similarly divided into—A, Ring-porous woods. Pores in early wood zonate, large and conspicuous, rarely small and inconspicuous; in late wood

small or few and scattered. Rays uniseriate or widely variable Texture medium to very coarse, and B, Diffuse-porous woods Pores numerous, usually not prominent on cross section; diffused throughout growth ring instead of collected in a decided ring or zone in the early wood; occasionally more numerous and very often somewhat larger in the early wood. Growth rings principally defined by the greater density of the late woods or by the radial flattening of the outermost rows of wood-fibre; often indistinct; sometimes absent.

These sub-sections are again divided and sub-divided while in each sub-section examples are given, so that the student can with the aid of a specimen follow and so learn how to apply the key to other species.

The advisability of drawing up a key for Indian timbers has not infrequently been considered. Mr. Gamble, probably our greatest expert on Indian timbers, gave it as his opinion that it was not possible to prepare a general key with any hope of making it of practical use, and this is probably a correct view of the case. However, it is quite probable that local keys could be prepared, and were this ever contemplated it would be useful to carefully study the volume under review. The reason for stating that local keys might be prepared with advantage is that it would limit the number of species to be dealt with, while it might be found possible to prepare not local but modified keys for a given group of species such as for the conifers, *Calophyllums*, *Dipterocarps*, *Dalbergias*, *Albizzias*, *Acacias*, *Diospyros*, etc., which have many distinctive features and characters of their own.

Mr. Samual J. Record's book ends with a long list of references, an Index, Map of America and six full size plates illustrating the structure of a variety of timbers.

We sincerely congratulate the author on the useful, clearly written and well illustrated treatise on the Structural and Physical Properties of Wood.

A REVIEW OF THE FOREST ADMINISTRATION REPORT OF THE JAMMU AND KASHMIR STATE FOR THE YEAR 1910-11 (SAMVAT 1967).

The total area of the three classes of forests (demarcated, partially demarcated and undemarcated) under the control of the State Forest Department stood at 4,615 square miles at the end of the year as compared with 4,214 square miles at its beginning, the increase of 401 square miles over the figures of 1966 being chiefly due to the progress of demarcation in the Jammu Province and to the revision of areas consequent on more accurate surveys. Form No. 61 of the report tabulates the alterations in the three classes of forests during the year as follows :—

Class of forest.	Area at the commencement of the year.	Added during the year.	Total.	Excluded or transferred to other heads.	Area at the close of the year.
	Sq. miles.	Sq. miles.	Sq. miles.	Sq. miles.	Sq. miles.
A—Completely demarcated	3,074	406	3,480	75	3,405
B—Partially demarcated ...	291	155	446	16	430
C—Undemarcated ...	849	477	1,326	546	780
	4,214	1,038	5,252	637	4,615

It will be seen from the above statement that the largest alterations in the area concern the undemarcated forests which had, during the year, 477 square miles added to them while 546 square miles were transferred to other heads, chiefly to completely and partially demarcated forests. It is not, however, clear from Form No. 61 whether the increase in the undemarcated forests represents a real gain or is simply due to periodical revisions of areas already subject to the control of the Forest Department.

The preservation of forest tracts outside the newly-demarcated areas in the Jammu Province and the formation of communal forests has not as yet received the consideration that the subject deserves, and the Conservator is justified in expressing the fear

that unless early measures are adopted to bring these tracts under a rational system of working, their disappearance is merely a question of time.

Good progress is reported in demarcation and surveys, but the latter work is evidently confined to boundary surveys and to enlargements from the Atlas sheets, the only maps available at present. These contain but few topographical details. The Darbar will, no doubt, avail itself of the opportunity afforded by the topographical survey operations of the Survey of India which are now in progress in the State, to procure accurate forest maps, but it means the complete demarcation of each forest area before the Survey of India takes it in hand.

Progress in the preparation of working plans has kept pace with other improvements, and 31 per cent. of the entire forest area is now being worked under their provisions. Of the four completed working plans, however, only one has yet received the sanction of the Darbar.

There is a decrease both in the length of paths constructed and the amount spent on road work as compared with the work done in the previous year; and although more has been spent on repairs the amount (Rs. 1,516) seems still too low, considering the hilly nature of the country and the damage caused to roads and bridges by snow and floods. The Conservator notes that the opening and keeping up of means of communications in the remoter parts of the country is done at the sole cost of the Forest Department. Why should not the Revenue or Public Works Department of the State defray a portion of the cost of construction and of the maintenance of those works, as is usually done in India?

The progress in the construction of new buildings to house the Forest establishment and in keeping existing buildings in repair is most satisfactory, and should, if continued, result at no distant date, in better protection and increased revenue to the Darbar.

There was a recrudescence of forest offences as compared with the decrease in the previous year, there being an increase of 54 cases. The percentage of convictions in court cases fell from

32·7 to 23·95. The decrease in the previous year was attributed to more liberal grants of forest produce to the tenantry. The present increase is put down mainly to unauthorised fellings.

The Conservator has some strong comments to offer about the delays of courts in disposing of forest cases, and justly remarks that such delays practically ensure acquittals. Convictions obtained long after the dates of occurrence of offences cease to act as deterrents and are in so far of little value in preventing damage to the forests. The remedy for this undesirable state of things lies, as has been proposed by the Conservator, in granting powers of arrest to forest officials and in admitting evidence taken down by Divisional Forest Officers in a court of law; but evidently these proposals have not yet received the sanction of the Darbar. It will also improve matters if the Darbar or the High Court of the State were to pass an order making it obligatory on subordinate courts to dispose of forest cases within a fixed period from the date of institution of proceedings in each case.

The continued success in protection from fire is noteworthy, the total area burnt being only 3,367 acres. At higher altitudes the forests are more or less self-protected, this dispenses with the necessity of special protective measures, but in the low-lying chir forests of the Jammu Province which are very inflammable special measures are required every year to keep out fires; and it is in these areas that the damage caused by forest conflagrations has been more marked. The expenditure of Rs. 718 incurred on fire-protection appears far too small to ensure success in this direction.

Grazing is practically unrestricted over the whole forest area of the State and is entirely under the control of the Revenue Department. The Forest Department is, however, authorised under certain restrictions to close up to one-fifth of the total forest areas, and we should like to see effect given to this.

Damage caused by bears to young trees of deodar and blue pine is said to be serious in many localities, but Forest Rangers are not allowed to shoot the animals. In the case of similar damage in the hill forests of North India, Rangers are encouraged to shoot

black bears by offers of rewards of Rs. 20 or more per animal shot.

Natural regeneration of deodar and blue pine is reported to be generally good in the lower zone of coniferous forests but that of the firs is said to be poor in the higher zone. Various causes are assigned for the paucity of new growth of firs of which density of cover overhead, severity of climate and over-grazing are the chief. Of introduced exotics *Robinia pseudo acacia* and the Hardy Catalpa promise success, but the species of Eucalyptus have proved a failure.

Root-cuttings of kuth (*Saussurea lappa*) have been fairly successful at Pahalgam, but sowings at Kodara are said to have failed. Kuth seed, if collected when mature, *i.e.*, in the beginning of November, germinates readily within a month from the sowing, but the habit of the young seedling is somewhat different to that of the mature plant, and possibly many young plants may exist where none are believed to occur at present. These plantings and sowings of kuth are being made by the Forest Department in the interest of the Revenue Department which forms the revenue from this source although kuth is strictly a forest product.

In two out of the nine Forest Divisions major forest produce is exploited on the selection system under the provisions of working-plans ; elsewhere improvement fellings, as prescribed by working-plans, and unregulated fellings, are the methods employed. The latter method of working will no doubt give place to more scientific methods as more forests are brought under systematic working, but the regulation of felling for free grants of timber where limited forest areas are set aside for this purpose may present difficulties in times to come. The selection fellings yielded 1,334,631 solid c.ft. of timber from 11,859 deodar and pine trees, or 112·5 c.ft. per tree.

It is interesting to note the increase in revenue from sales of minor produce. In the list of produce exploited species of edible fungi (*Guchhi*) which are exported to the Punjab annually in large quantities do not find a place. Probably they are farmed by the Revenue Department of the State.

Exclusive of free grants departmental agency was responsible for 24 per cent of the timber exploited ; this shows a decrease of 1 per cent over the preceding year's figures. Free grants to the tenantry absorbed 72,935 c.ft. of timber and 15,759,279 c.ft. fuel, but the latter is only an estimate. Messrs. Spedding and Co. hold the timber monopoly in Kishtwar and Kishanganga, and paid on an average Rs. 55-15-5 per deodar and Rs. 10-11-2 per blue pine tree. These rates appear low as compared with the rates for similar trees in North India.

The total outturn in timber and fuel was 28,715,227 c.ft. as compared with 39,074,994 c.ft. of the preceding year ; the decrease was chiefly under removals by purchasers and concessionists. Exploitation by State agency resulted in an increase of 42,536 c.ft. in the outturn of timber, but in a decrease of nearly one lakh c.ft. of fuel.

The gross revenue of the year was Rs. 18,02,879 as compared with Rs. 17,08,464 and the surplus showed an increase of Rs. 87,939 over that of the preceding year, and of Rs. 3,28,576 over the average of the five past years. The increase is attributed to larger sales of timber in the Chenab and Jhelum Divisions which are the sale depôts for supplying the Punjab markets.

The percentage of total charges to gross revenue was 28·31 against 29·50, and the percentage of B. Establishment charges to gross revenue was 11·96 against 12·31 of the previous year. It is to be noted, however, that of the total expenditure of Rs. 2,94,768, departmental operations under AI, are responsible for Rs. 2,02,221, leaving a balance of Rs. 92,547, or 5·13 per cent of the gross revenue for works of improvement.

Notwithstanding the larger sales in the Chenab and Jhelum Divisions the rates obtained were lower all round than in the preceding year indicating either a glutted condition of the timber markets or possibly a deterioration in the quality of timber exported.

The strength of the establishment rose from 764 to 793 in the year under review, but the increase was chiefly in the number of office peons, and the number of Rangers, although increased by

two, is still inadequate for the 42 Ranges into which the forests have been lately divided. This deficiency is, however, being made up by sending every year suitable candidates for training to the Dehra Forest College and in a few years all the ranges should be in charge of trained Rangers.

The charge of the State forests was held by Mr. W. H. Lovegrove, I.F.S., till about the close of the year, but the report was written by Mr. R. C. Milward, I.F.S., who officiated as Conservator during the former's absence on leave. The report embodies a concise and clear exposition of sustained progress in various directions, and both the Darbar and the Conservator are to be congratulated on the success of the year's administration.

The Conservator's charge with its ten Divisions, comprising an area of nearly 3,400 square miles of a mountainous country, appears, however, to be excessive and the physical importance of the areas, their efficient control with a view to increase the revenue and the welfare of the population depending on them alike seem to call for two Conservators. As has been remarked before, the State has been very fortunate in securing Mr. Lovegrove as its Conservator. Under his administration, although still much remains to be done, progress has been very marked and the state of the forests to-day is very different to what it was not so very many years ago.

THE FORESTS OF THE PHILIPPINES.

There is an interesting sketch of these forests in the *Scottish Geographical Magazine*, which we print below:—Professor Paul Goode contributes to the *Bulletin* of the American Geographical Society a paper on this subject, based upon the publications of the Philippine Bureau of Forestry. Of the 120,000 square miles which constitute the total area of the archipælago no less than one-third, or 40,000 square miles, remain in the condition of primæval forest. About 20,000 square miles are covered with a second growth of forest, 48,000 square miles are in grass land, and only 12,000 square miles are under cultivation. Of the cultivated area, not

more than half is under cultivation at one time, so that the total population of the islands, about 8,000,000 persons, is supported by the cultivation of only 5 per cent of the area. The origin of the grass lands is exceedingly interesting. In order to prepare land for cultivation the trees are partially cut down, and the branches, etc., after drying, are fired ; rice, sweet potatoes, Indian corn, etc., are then planted in the soft ash. But after one or two crops have been taken off, the cogon grass begins to take possession, and its network of roots and its rank growth make it impossible with primitive implements to get a crop from ground which it has invaded. The patch is therefore abandoned, and a new clearing made, so that the grass land is continually extending. The fact would be of less consequence were it not that the grass is practically useless for fodder, and thus these lands are unproductive. Under natural conditions the forest would doubtless encroach upon the grass, but here again man interferes. His forest fires destroy all young seedlings, for in the dry season these areas of rank grass burn rapidly, though the grass springs afresh after the burning. Obviously then the administration has some serious problems before it.

The forests themselves are arranged under a number of different headings, but the important point is that they resemble tropical forests in general in their great number of species. It is estimated that some 2,500 species of trees occur, and in one case no less than eighty species were counted in an area of one acre in extent, while of these only two reached a merchantable size when mature. Fortunately, however, the Dipterocarps, which reach a great size and can be used to furnish construction timbers, tend to occur in pure stands, in a fashion that will justify the use of modern logging methods. In all about one hundred species may be reckoned on as of commercial value. Meantime a large amount of timber is imported into the archipælago from America. Among the minor forest products it is noted that there are hundreds of square miles of nipa swamps, and the sap from the flower stalk of this palm has a very high sugar content, and can be used to produce commercial alcohol.

COLONEL BAILEY, R.E.

At the Summer Graduation Ceremony at Edinburgh University on 5th July, the degree of LL.D. was conferred upon Colonel Bailey, R.E., formerly Secretary of the Royal Scottish Geographical Society and Lecturer on Forestry in the University.

The Dean on presenting Colonel Bailey for the degree, said:—

"Our late Lecturer on Forestry, while still a young officer in the Royal Engineers, was attached to the Indian Forest Department, where his thorough and excellent work earned high official commendation. As Superintendent of the survey branch, he originated the system of training intelligent natives to perform surveying work previously reserved for the European establishment, thereby effecting important economies. He organised a new Indian Forest School; for some years he supervised the British students at the French Forestry School at Nancy; and he was acting as Inspector-General of Indian Forests when he was invalided home in 1890. Edinburgh was then the pioneer among British Universities in providing a scientific education in Forestry and she gladly secured for her lectureship Colonel Bailey's unique training and ripe experience. The success of his course on the principles and practice of forest management is attested by the number of his pupils who now hold important appointments at home and abroad. To his initiative we owe the institution of a degree in Forestry, which promises to do much to foster and encourage the scientific study of the subject."—[*Scottish Geographical Magazine.*]

RAMIE FIBRE.

We learn from a correspondent in England that Mr. Finlow, the Jute expert, has sent Home a parcel of ramie ribbons prepared by a new steaming process with which he experimented at Dacca. At the end of the present season he will send a larger consignment in order to ascertain the actual commercial value of ramie so decorticated.

* * * *

The decortication is accomplished by placing the freshly cut green stems in wooden boxes which are closed, 8 ft. long, 2 ft. wide and 20 in. deep, steaming therewith superheated steam for about 20 minutes at 302 degrees F., then opening the chests, taking out the stems, and stripping them by hand. The steam employed is generated in small portable boilers of the tubular type, which can be moved from place to place in the fields in wheels.—[*Capital.*]

U. S. FOREST RANGER QUALIFICATIONS.

The requirements and duties of forest rangers on National Forests in the United States are thus described in "The Use Book," which contains the regulations and instructions for the use of the National Forests:—

"A ranger of any grade must be thoroughly sound and able-bodied, capable of enduring hardships and performing severe labour under trying conditions. He must be able to take care of himself and his horses in regions remote from settlement and supplies. He must be able to build trails and cabins, ride, pack and deal tactfully with all classes of people. He must know something of land surveying, estimating and sealing timber, logging, land laws, mining and the live-stock business.

"On some forests the ranger must be a specialist in one or more of these lines of work. Thorough familiarity with the region in which he seeks employment, including its geography and its forest and industrial conditions, is usually demanded, although lack of this may be supplied by experience in similar regions.

"The examination of applicants is along the practical lines indicated above, and actual demonstration, by performance, is required. Invalids seeking light out-of-door employment need not apply. Experience, not book education, is sought, although ability to make simple maps and write intelligent reports upon ordinary forest business is essential.

"Where saddle horses or pack horses are necessary in the performance of their duty, rangers are required to own and

maintain them. The Forest Service furnishes no personal or horse equipment.

"Rangers execute the work of the National Forests under the direction of Supervisors. Their duties include patrol to prevent fire and trespass, estimating, surveying, and marking timber, the supervision of cuttings, and similar work. They issue minor permits, build cabins and trails, oversee grazing business, investigate claims, report on applications, and report upon, and arrest for, violation of forest laws and regulations."

The examination consists of questions regarding the use of the forest, supplemented by a field test to show the applicant's fitness to do the actual work of a ranger. Education and experience are rated on the answers to the questions on these subjects in the application form and on the applicant's use of English in the written test. Horses for the test in riding and packing are provided by the Forest Service.

The examination is under the control of the Civil Service Commission, and not of the Forest Service.

The law requires that, when practicable, forest rangers must be qualified citizens of the State or Territory in which the National Forest on which they are appointed is situated. Since the list of local eligibles must be exhausted before eligibles residing in other States can be appointed, the chance of citizens of outside States who go to the National Forest States and take the examination to secure an appointment is small.—[*Canadian Forestry Journal.*]

CIRCULAR No. 6-2-12.

FROM

F. BEADON BRYANT, ESQ., C.S.I.,

Inspector-General of Forests to the Govt. of India,

TO

ALL CHIEF CONSERVATORS, CONSERVATOR,

Except Madras and Bombay.

SIMLA, *the 9th July* 1912.

SIR,—I have the honour to inform you that, after considering the replies received to my Circular letter No. 14, dated the 19th

December 1911, regarding the special surveys of small blocks of forest areas, I have decided that it is not possible to lay down any general rule regarding the size of forest areas which should be surveyed by the Forest Department when special surveys are considered necessary. The existing rules regulating the procedure to be followed in dealing with forest surveys, which were promulgated with my Circular letter No. 7-159-7, dated the 29th April 1910, require the previous sanction of the Government of India before special surveys can be undertaken (see Rule III) and should adequately guard against such surveys being carried out by the Survey Department where they can be done sufficiently well by local agency. These rules should be strictly adhered to and Conservators should arrange to carry out any special surveys required by local agency so far as this can be done with sufficient accuracy for the purpose required.

2. As regards suggestions made by certain officers in their replies to my Circular referred to above, to the effect that special surveys by the direct agency of the Survey of India Department might be rendered unnecessary in some cases if that Department could lend a survey officer to supervise the work of local surveyors, or if trained Indian surveyors with small parties could be placed at the disposal of the Forest Department to survey small blocks of forest, a copy of a letter* from the Surveyor-General, showing to what extent it may be possible to provide assistance in the directions indicated is forwarded herewith.

*No. 715-T., dated 29th June 1912.

I have the honour to be,

SIR,

Your most obedient servant,

(Sd.) S. CARR,

for *Inspector-General of Forests.*

Copy of a letter from Colonel S. G. Burrard, C.S.I., R.E., F.R.S., Surveyor-General of India, to the Inspector-General of Forests, No. 715-T., dated the 29th June 1912.

WITH reference to paragraph 3 of your letter No. 465-2-10, dated the 30th May 1912, I have the honour to state that this Department is too short-handed to lend survey officers for supervising purposes. Arrangements might, however, be made to lend the services of surveyors if their work was supervised by forest officers. But the Department is very short-handed even in the case of surveyors, and Survey Superintendents will demur at having their surveyors taken away. So applications for the loan of surveyors would have to be scrutinised and only made in really special cases. They would also have to be made at a certain fixed time each (May for preference) so that survey programmes could be arranged accordingly.

CIRCULAR No. 7-75-6.

FROM

F. BEADON BRYANT, ESQ., C.S.I.,

Inspector-General of Forests to the Government of India,

TO

ALL GOVERNMENTS AND ADMINISTRATIONS.

SIMLA, *the 10th July* 1912.

SIR,—With reference to Government of India Resolution No. 10F-76-3, dated the 22nd June 1912, regarding the inauguration at the Forest Research Institute and College, Dehra Dun, with effect from the 1st November 1912, of an entirely separate two years' course of instruction for candidates for direct appointment to the Provincial Forest Service, and rule 18 of the College and Institute admission rules, I have the honour to intimate that, owing to the short notice given, the President of the Institute will not hold *in the present year* any examinations in English and Mathematics. As an exceptional case, however, a course in Mathematics will be given at the Institute, possibly in the place of

the Zoology Course. In future years the rules as sanctioned by the Government of India will be strictly adhered to.

2. It is requested that all applications for nominations to join the 1912—14 class may reach the President by the 1st September next.

I have, etc.,

(Sd.) S. CARR,

for *Inspector-General of Forests.*

CIRCULAR No. $\frac{13\text{-F.}}{190-1}$.

FROM

H. B. HOLME, ESQ., I.C.S.,

Under Secretary to the Government of India,

TO

ALL GOVERNMENTS AND ADMINISTRATIONS.

SIMLA, *the 3rd July* 1912.

SIR,—I am directed to invite a reference to paragraphs 1 (*b*) and 3 of this Department's Circular No. 7-190-24-F., dated the 24th April 1911, dealing with Resolution No. XIII passed by the Board of Forestry in March 1910, in which it was recommended that selected forest officers should be allowed to visit Dehra for the study of any particular subject in which they desire to carry out research work. It will be seen that the matter was left over for further consideration. Two years have now elapsed since the Board of Forestry made their recommendation, and during this time work at the Forest Research Institute has made great progress. The Government of India consider it is of great importance that all gazetted forest officers should be in touch with the Research Institute and keep themselves acquainted with the work and investigations which are in progress there, and, though deputations for special study have not yet been arranged for, they would be glad to see all promising officers encouraged to pay short visits to Dehra of, say, ten days or a fortnight, during which

time they would be able to inspect the Museums, the Chemical Laboratory and the Herbarium. They would thus gain a general knowledge of the investigations which have been and are being undertaken—and of the wide-spread effects that these may be expected to have on the sylvicultural treatment of the forests and on the development of forestry in genera.

2. Should it be considered desirable that an officer should pay a more extended visit to Dehra for some particular purpose or with some special object, *e.g.*, to consult the herbarium in connection with the preparation of a local 'Flora,' it will be open to local Governments to allow him to do so, and the President, Forest Research Institute, will endeavour to give him every facility for prosecuting his enquiries. During such period of deputation officers would receive their full pay and allowances, and may be allowed travelling allowance to and from Dehra Dun, but no daily allowance during halt there. The most convenient time for such visits would be during the monsoon, July to October, and

I am to suggest that with the permission of $\frac{\text{His Excellency the Governor in Council}}{\text{His Honour the Lieutenant-Governor}}$ / your permission

any forest officer who wishes to do so, and who, it is considered would profit by such visits, may, after consultation with the President, Forest Research Institute and College, be allowed to visit Dehra on duty for the purpose set forth above.

I have the honour to be,
SIR,
Your most obedient servant,

H. B. HOLME,

Under Secretary to the Government of India.

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TEAK AND BAMBOO IN BURMA.

In the *Indian Forester* for August 1912 Mr. Leete has emphasised " the necessity for taking the flowering of the bamboo as the pivot on which to hinge all schemes for improvement of the forest, with teak regeneration as the main objective." It is, I think, generally found that when a subject has been well ventilated, and time has been allowed for verifying the suggestions public opinion will tend, perhaps slowly but inevitably, in the direction of the truth ; and to my mind therefore it is significant that although this view has been strenuously advocated by Mr. Ribbentrop and others, it has not gained in favour, but on the contrary tends to fade gradually into obscurity. I understand, however, that Mr. Leete desires further discussion of this view, but although I appreciate his kind reference to myself, I hope he will not take it amiss that I should nevertheless attack many of his suggestions in my usual savage and uncouth manner.

2. Although it may be denied that we have generally a tendency to imagine and to distort facts to fit in with a particular

view, yet there is, I think, no disputing that it is far sounder to ascertain exactly and correctly what the facts are first, and to draw conclusions from them. After Mr. Leete's interesting description of the effects of fire-protection, it is perhaps superfluous to point out that if it is desired to study teak in its natural and normal state, attention should be confined to unprotected forests. Before, however, discussing the question of reproduction at the time of the flowering of the bamboo, I wish to draw attention to a few facts regarding the peculiarities of teak reproduction at other times. These can be readily verified, and I think throw some light on the whole question of reproduction.

3. We are, I think, unconsciously influenced by the fact that in a Taungya plantation germination invariably takes place almost immediately. We are also accustomed to reliable germination in Europe, where if conditions are created favourable to germination, it is not unusual to find two or three hundred seedlings per square yard. In Burma, however, although we know that teak seedlings spring up naturally in gaps and in places where the cover is sufficiently open, and although, so far as I can see, there is no earthly reason why it should not be possible to get successful results from dibbling teak seed in such places, yet the fact remains that although the experiment has been tried hundreds of times, no one has, so far as I am aware, been able to attain success. This points to the conclusion, and I think other evidences could be produced, that the germination of teak is very erratic. It is a matter that is apt to be overlooked, but as it has upset many calculations, it should be borne constantly in mind. It is details such as these which defeat the most attractive schemes when put into practice.

4. Another point to which I wish to draw attention is the fact that the growth of a teak seedling is also very erratic and unexpected. A very common type of seedling is one with two large conspicuous leaves with a thin stem about two feet high, and from our experience of Taungya seedlings we are, I think, apt to assume that this stage is reached in one year. It has also been constantly reiterated, although there is no foundation for the

statement, that " it takes a seedling ten years to establish itself against fire ", and this has, I think, given rise to an impression that the kind of seedling described is from one to ten years old, and that the size of larger seedlings and those with woody stems corresponds with their ages. The age can be ascertained fairly approximately by cutting a section through the top of the tap root, and in order to get rid of wrong impressions and to ascertain the true facts, I would strongly advise any one who has not done so, to determine the age of a few seedlings in this way. It would, I think, be found that one and two-year-old seedlings are extraordinarily hard to find, the reason being that as growth is very much slower in the jungle than in a Taungya, the seedlings are at first very small and inconspicuous. It would also be found, I think, that seedlings are affected in the most extraordinary manner by shade, growth frequently on this account being almost stopped, and it is for this reason that the appearance and size of seedlings is so deceptive. Reproduction, for instance, which appears even-aged and to have originated a few years ago, is sometimes found to have been spread over a period of thirty or forty years, which is a further proof of slow and erratic production ; and again in a protected area where the influence of fire is eliminated, it is often found that the existing seedlings, although small, originated before the area was protected and have been retarded by the shade ; and in fact it is usually difficult to find seedlings which have originated under protection. On the other hand, fire alone does not seriously retard the growth. This is proved by the statistics in the next para., the first of which relates to seedlings in an unprotected area where the seedlings had free access to the light, but were exposed to not less than the ordinary risk of fire. At the same time, however, and this counteracts many of the disabilities under which they suffer, although the growth is affected so greatly by shade teak seedlings appear exceedingly tenacious of life, and can endure a considerable amount of shade for many years without being killed.

5. The following statistics recorded in an experiment carried out for that purpose throw some light on the effect of

the flowering of bamboo on teak seedlings already on the ground :—

	1st plot.	2nd plot.
Height at time of flowering ...	2′ 3″	4′ 0″
Height in second year ...	5′ 9″	6′ 1″
Height in third year ...	9′ 2″	8′ 10″

This appearance even more than the actual measurements gave evidence of the wonderful manner in which they respond to the removal of the bamboo canopy. From being sickly and unpromising the seedlings soon looked as healthy and vigorous as any Taungya seedlings. The fact that a great many saplings are found kinked at the level of the bamboo canopy seems to indicate that seedlings frequently do penetrate the canopy, but nevertheless I am inclined to the opinion that the principal factors favouring natural regeneration are the natural removal of the bamboo canopy at periodic intervals, and the tenacity with which they cling to life between the intervals.

6. I myself am perhaps inclined to under-estimate the damage caused by mild leaf fires, but although I have ventured at times to express an opinion that fire-protection against mild leaf fires was showing an unnecessary and too tender a solicitude for a very sturdy and hardy species, yet I have always considered that when the bamboo flowered and died, the circumstances were entirely changed. At such times there is an extraordinarily large amount of inflammable material, and therefore it has always seemed to me peculiarly surprising and inconsistent that instead of protecting them more vigorously than ever until the dead stems had disappeared, it should have been contemplated that at such times only the forests should be deliberately fired. My experience of a *Myinwathon*, however, caused me to reconsider my views. By the third year the bamboos had become rotten and began to

fall over, and it was found that in the unprotected area the seedlings, which I have described as so promising, were badly injured. In some cases the seedlings, although sufficiently vigorous to resist an ordinary leaf fire, were burnt back to the ground, but in such cases of course little harm was done. In a great many cases, however, the leading shoot was destroyed, or the seedlings were burnt on one side, or damaged in such a way as seriously to impair their value. It was, in fact, evident that if a *wathon* area were not protected, it would be necessary to go thoroughly over the area to carry out prunings and clearings. If however the effect was distressing in the unprotected areas, it was appalling in the areas protected from fire. In many cases whole clumps of bamboos had fallen over, and a large proportion of the seedlings were bent over to the ground. They were of course not killed, and a side branch from the middle of the bend promptly developed as the leading shoot, but it was evident that their value was destroyed. Whereas the damage to the seedlings in the unprotected areas could be repaired, there was such a litter and mess in the protected areas, that if a *wathon* were extensive, as will be the case when the Kyathaung flowers, it would be impossible to get over much ground in order to attend to the seedlings.

7. As regards the question of natural reproduction of teak at the time of the flowering of the bamboo, teak is a light demander and it seems, therefore, reasonable to expect, and perhaps preposterous to doubt, that natural regeneration should be very greatly stimulated by the removal of the bamboo canopy. If, however, we are to act on this theory, it seems only reasonable to insist on clear proof that particular abundance of reproduction has actually been caused by the flowering. Mr. Leete maintains that "we should recognize the fact that Nature provides us with excellent regeneration at special times every 30 to 50 years," yet although he gives us to understand that three different species of bamboos have been flowering in his division within recent years, he fails to state whether this has resulted in any reproduction whatever. Personally I have seen several *wathon*

areas, but have never noticed any particular abundance of reproduction having originated in consequence of the flowering of the bamboo, and although bamboos have flowered within recent years throughout the Northern and Southern Circles, I cannot recall any authentic instance in which such has been recorded. Corroborative evidence can be obtained from *Kyathaung* forests where it is known that no flowering has occurred since 1852. This bamboo flowers simultaneously and gregariously over large areas, and only at very rare intervals. According to Mr. Leete's theory therefore, it should be possible to find clear and distinct age gradations corresponding with particular abundance of reproduction in 1852 and in other years of flowering, but if he were to attempt to find these age gradations, and to calculate from them in what years flowering had occurred, he would find, I think, that they did not exist, and would realize perhaps that he has allowed his imagination to run away with him. As one or two-year-old seedlings are very hard to detect, the fact that I have not noticed any reproduction caused by a *wathon*, does not satisfy me that none does occur at such times. I remember, however, noticing some remarkably true reproduction of teak in an old *wathon* which appeared to be a genuine case in point. It was not, in fact, until I examined the rings in the tap root, that I discovered that the reproduction had originated previous to the flowering, and I wish, therefore, to emphasize the desirability of distinguishing carefully between advance growth and reproduction caused by a *wathon*. I am however on surer ground when I express the opinion that the reproduction caused by a *wathon*, if any occurs, is of little importance, and that it is on the reproduction which springs up between the intervals of flowering on which we have mainly to rely.

8. A small point which is easily overlooked is whether, assuming that a certain amount of reproduction were found to be caused by a *wathon*, it could compete successfully with the new bamboo crop which springs up at the same time. In the forests of which I have had experience the *Tin* has struck me as a very inferior bamboo which has ordinarily dragged out a miserable

existence under the *Kyathaung*, and has only attained a fictitious importance in protected areas. It is, therefore, I think, not so typical a bamboo as the more social *Myin* and *Kyathaung*. Brandis estimates the maturity of *Kyathaung* at about 8 to 12 years, and this accords with the tradition recorded in "the log" from Bassein in connection with the flowering of 1892. As regards *Myin*, although slow growing and susceptible to fire for a few years, yet after about 5 to 10 years it generally becomes dense and develops quickly. I quite agree with Mr. Leete that the growth of bamboos is frequently erratic. The new crop of bamboos, I think, frequently has difficulty in establishing itself in many places owing to a dense growth of weeds, which would however also affect the reproduction of teak, but while I do not think that *Tin-wa* would ordinarily cause much trouble to teak reproduction, I am inclined to think that the latter could not compete successfully with a new crop of *Kyathaung*, or even with that of *Myin*. As shown by Mr. Leete, with fire-protection the competition would be hopeless, and might even affect advance growth.

9. There is of course always the chance that our sowings may be successful, while Nature's amateurish efforts fail. My experience is based mainly on the opportunities I had to observe, near the headwaters of the Myittha, the effects of a flowering which advanced over the greater part of the Chindwin some years ago. The Sub-Divisional Officer stationed at Ganjaw dibbled in a considerable quantity of teak seed, and at the same time carried out several experiments to test various views and to collect definite information. In one plot where the dead stems were cut and burnt, and the conditions assimilated therefore to a Taungya plantation, some success was attained; but dibblings, sowing broadcast with and without hoeing, etc., seemed very uncertain and practically useless. Returning to my headquarters at the end of the season *viâ* Mingin and Mangrove, I was able to hear what was being done in other Chindwin Divisions. It appeared that although extensive dibblings had been carried out, the results had proved unexpectedly disappointing. There appears ample light for reproduction at such periods, and I can only suggest that the lack of success is due

to the cussedness of teak, and to the fact that by procrastination it loses a favourable opportunity.

It has never been contended that the measures proposed for the treatment of the *Kyathaung* forests were not equally suitable for more modest bamboos, and as most of us have come across *wathons* at some time or another, it can hardly be doubted that *wathon* sowings have been frequently attempted. It is not certain that had the results been successful they would have been recorded with a great flourish of trumpets, and is it not probable that the lack of interest which Mr. Leete is so anxious to dissipate, is due to the fact that when putting this view to the proof, we have found that it does not come up to our expections?

10. Mr. Leete appears to base his conclusions entirely on a statement made by Mr. Lace. It is not quite clear whether teak seed was dibbled in at a small cost and proved more or less successful, or whether a certain amount of reproduction sprang up merely as the result of refraining from fire-protection, but apparently little importance was attached to the result either way. The point he emphasized was that the reproduction which originates before flowering is adequate, and that nothing further is required. So far from justifying Mr. Leete's conclusions therefore, this opinion supports the opposite view, that it is the reproduction which originates between the intervals of flowering and when the bamboo is mature, which is the more important and on which we have mainly to rely. Mr. Leete's opinion, therefore, appears to be simply that provided we dispense with fire-protection reproduction is ample, but that at the time of the flowering it is desirable further to carry out prunings and clearings in order to repair the damage caused by the destruction of the dead, flowered stems. Mr. Beadon-Bryant has confined his attention principally to *Kyathaung* forests. He published excellent photographs showing typical reproduction between the intervals of flowering, and emphasized the fact that the one thing needful in this class of forest to ensure adequate reproduction, is to abolish fire-protection, and I may perhaps be allowed to add that this is also my own humble opinion.

11. Mr. Leete touches on the question of repairing the injury which has already been caused to natural reproduction. An Indian Conservator who of course regarded fire as his natural enemy, expressed the opinion that we could make good any loss caused by protection by the axe, the saw, and the *da*, but his statement at once roused a storm of protest from Burma Officers of practical experience. Mr. Beadon-Bryant voiced the general opinion regarding this point when he stated that "the hand of man can in this manner influence but to a small degree the forces of Nature." "It would," he continued, "be equally easy to stop the tide as to keep down the inferior species and bamboos which fostered by fire-protection are impossible to control." Mr. Leete emphasizes the fact that when the bamboos are thoroughly established they scoff at fires, and it seems therefore that the only thing to be done is to wait patiently until the next flowering acts as a spring cleaning, and again further until the new crop of bamboos attains maturity, when reproduction of teak will again creep in gradually.

12. There are one or two minor points on which I feel moved to hazard an opinion. Mr. Leete states that "as no one knows the rates of mortality it is not easy to say whether any class is sufficiently well represented to keep up to the level of the next above it." I would commend to his notice two useful branches of knowledge, a smattering of which is, I think, more useful in a tropical forest than the whole Science of Artificial Forestry, namely, the knowledge accumulated with respect to the struggle for existence, and that accumulated for actuarial purposes. He must be aware that in a census report the table of population classified by ages constitutes a rough actuarial table, in which the differences in numbers represent the natural mortality between the ages. This is due to the fact that mortality is constant. It may seem highly fantastic that in the struggle between human beings and bacilli the scale should be so delicately balanced as to result in constant mortality, but he will find this point clearly illustrated and in a popular manner by H. G. Wills in "The Martains". In a natural forest the struggle for existence is more direct, one species competing with another similar species, and

Mr. Leete must know that serious scientific men accept the fact that this has resulted in the course of centuries in a stable balance and in constant mortality. It therefore follows—and if Mr. Leete is still sceptical, I would advise him while he is on leave to consult a learned professor on this point—that an enumeration of teak on a sufficiently large scale, and if classified by ages, must also similarly form an actuarial table for teak, and if he examines the statistics collected for working plans he will find that the age classes are graduated, and that the older age classes decrease in numbers in the manner one would expect on this view. He may not have noticed that as more progress is made, instead of attempting to regulate the yield by volume as advocated by the Sylviculturist of the Research Institute,* opinion has hardened in favour of regulating the yield by area, and that instead of calculating the normal yield on the whole growing stock which would be the only sound method if the age gradations were irregular, it has become the invariable practice to base the calculations on one age gradation only. If, however, Mr. Leete were to assimilate what is known regarding the consequences of the struggle for life, he would, I think, discover the reasons for many conclusions we have arrived at slowly as the result of practical experience. He would, I think, realize that not only could the rates of mortality be calculated, but also that reproduction must be adequate to maintain the species, that there must be a normal series of age gradations, that the distribution must vary with the rainfall, soil, and other similar factors, and would find, in fact, that many of his difficulties and anxieties would disappear, and although he may prefer the attractions of an artificial forest, would discover, I think, that even a Burma jungle is not without interest.

It is unfortunate that large and unequal age or rather girth classes have been adopted in Burma. At present we enumerate seedlings and saplings although the statistics are never utilized for purposes of calculation. We seem to be slaves of custom, but to my mind it would be quite sufficient, and more simple, if one party only made complete enumerations with one foot girth

* *Indian Forest Records*, Vol. I, Pt. IV.

classes and counted every tree, while the other parties enumerated only trees over 5 feet in girth. The work would be done more rapidly, and yet it would be possible to prepare more detailed actuarial tables and to calculate the rates of mortality more accurately. If then the age classes were irregular in any forest, the fact would be brought more prominently to our notice, and lead us to seek for an explanation.

13. Mr. Leete raises the question whether it is sound policy to attempt to improve all our forests. He may be aware that there is a prejudice against landowners, who, having a monopoly of the land in a neighbourhood, hold up the land "to ripen". From a *quasi*-commercial point of view there are perhaps attractions in taking over the finest blocks of forest, and in being able, when the unclassed forests are exhausted, a process accelerated by reservation, to make our own terms for forest produce, but it was certainly not with these intentions that large blocks of forest were reserved. As a question of general policy, therefore, I think, if he considers the question, he must come to the conclusion that it is essential that, except in special cases where there are reasons to the contrary, we should attempt to do something with all our reserves, or if the task is beyond our powers, that we should abandon the superfluous portions which would then be of use in helping the modest requirements of the humble villager to be satisfied. In my opinion, however, the area is not excessive nor beyond our powers, provided that we consider practicability and do not attempt too elaborate and ambitious schemes.

14. A new recruit who desired to take an intelligent interest in his work would find, I think, the greatest difficulty in ascertaining what we are supposed to be driving at, and in discovering the facts on which our actions are based. We have, I think, no clear and definite policy, and at present seem to be merely drifting. For the last fifteen years at least we have been leisurely chewing the cud of reflection on the subject of fire-protection, and no sooner do we seem to be getting rid of the delusion that this is a universal panacea, than another red herring is dragged across our path in the shape of the uniform system and elaborate schemes for

establishing reproduction. It was officially recognized several years ago that fire-protection affects reproduction prejudicially, and it seemed to me that we were singularly unwise to ignore the fact that adequate reproduction is the basis of forest conservancy. It seems to me now, however, that we have suddenly gone over to the other extreme, and are displaying too great an anxiety about reproduction. We have to take a few simple facts into consideration. I have endeavoured to show that teak is "uncertain, coy, and hard to please", and that it has not yet succumbed to our cajoleries. This merely bears out what has been previously stated with more dignity, and although the opinion attracted great attention without contradiction, that with regard to reproduction "our somewhat costly Taungya system is the only one on which we can place reliance." Even therefore if we have the desire to carry out elaborate schemes to effect artificial reproduction, have we the knowledge?

15. We have also, I think, to determine whether there is any urgent need to establish any artificial reproduction. It is, I think, evident that no species could exist in a natural forest unless it reproduced itself in sufficient quantities to maintain its numbers in spite of the immense mortality to which it is subject, and referring to working plans statistics we have definite proof that in every forest there is an enormous preponderance of seedlings. Ordinarily, therefore, there would appear to be no necessity to resort to artificial reproduction, but the question has been complicated by the introduction of fire-protection. It is evident that we have now only the choice of two alternatives, either we must abolish fire-protection in which case we can rely on sufficient reproduction, or if we retain fire-protection, we must make good the loss of natural by artificial reproduction. I have laid myself open to facetious remarks regarding the great importance I attach to this question, but I am sure that any one who attempts seriously to follow the progress of sylviculture in Burma, must admit that it is a question on which we have got to make up our minds some time or other, and that the sooner we do so the better.

16. As regards the particular measures involving reproduction which have been proposed, the most prominent is the uniform

system. I have been rebuked for not joining in the chorus of delirious approval which greeted the proposal to introduce this system into Burma, but I confess that I see in it mainly a reaction against the slovenliness of a Burma jungle. Mr. Leete, for instance, expresses a preference for dealing with a small area, and would evidently contrive that there at least the ugly hand of Nature should be no more seen. We are taught to regard the continental forests as the height of perfection, and it is perhaps not unnatural that we should aspire to reproduce in these forests the orderly and systematic arrangement of the growing stock which is the principal feature of those forests, but we have to consider not only appearances but practical results. Little attempt has been made to give a clear idea of the benefits which would result when the change is complete. I understand that eventually the stock will be arranged more conveniently for extraction, but the benefit is discounted by the fact that in most cases each log would still have to be dragged and floated out separately. Assuming, however, that the result will be satisfactory in the dim and distant future, it is perhaps my fault, or rather misfortune, that I cannot understand what is supposed to be the effect of this work during the next 150 years while the change is in progress. The fact that ample regeneration is effected naturally is an asset of considerable value, the more so as our forests are large and our staff small. So far as I can judge, however, we are required to dispense with this, and are to regenerate our forests entirely afresh and in an unnatural manner. This would be a colossal undertaking, and it is evident that the work would occupy our energies to the exclusion of all other work, and would result in a great increase of expenditure. It appears also that the change would prejudice, or at any rate prevent any measures being carried out to improve the yield during the next 150 years. While therefore our expenditure would increase, our revenue would decrease, or at best remain stationary, and the financial results would, I think, be deplorable.

17. Mr. Leete's proposal to establish more plantations seems more promising, as we know that this work at least is practicable, and the results certain. The first point that strikes me, however,

is that if plantations are desirable, his Division seems most unsuited for them, and compares unfavourably with Arakan. Not only is Pyinmana remote from the market, but there is already such a quantity of natural teak and Pyinkado that few plantations could be made without destroying some of it. In Arakan, however, although teak is not indigenous, it grows more rapidly in plantations than, I believe, in any other Division in Burma. The jungle consists also of pure bamboo which can be sacrificed without a sigh, and is more easily cut over for Taungyas than any other kind of jungle. The greatest attraction is, however, its accessibility. Thousands of acres could be planted up on hills which slope directly down to large navigable rivers, in which rafts and not merely single logs could be floated out to one of the best ports in India at all times of the year. If Mr. Leete's views are sound, the obvious policy would be to abandon Pyinmana to the timber firms, leaving perhaps a junior assistant to protect existing teak, and to concentrate in this division until Akyab is as bright and gay with forest officers as Pyinmana or Tharrawaddy. This seems to be the logical conclusion of Mr. Leete's views, but in the words of the poet "I don't think". Plantations for the richer Divisions are a thing of the past. They have been tried and found wanting, and I think Mr. Leete will find it impossible to reawaken any further enthusiasm. In Burma the country stinks of teak, and it seems, therefore, a futile proceeding to create teak artificially, and to spend the rest of our service in gradually hacking out about 90 per cent. Thinnings in even-aged plantations require skill, and may be congenial work, but it certainly seems more sensible and fitting that instead of spending all our time on hacking down immature teak, we should concentrate our energies on saving immature teak which would otherwise be killed by inferior species. If the natural teak were arranged tidily in even-aged gradations, as in plantations, Mr. Leete would be the first to insist that they should receive adequate attention. I am prepared to humour him so far as to admit that teak in existing plantations should be properly attended to but can he give me any reason why natural teak seedlings and saplings should not receive exactly the

same attention, and should not at regular intervals be allowed more room for development ?

18. On the principle that a bird in the hand is worth two in the bush, a seedling or sapling on the ground is worth two in the womb of time, and I maintain, therefore, that our first duty is to look after what we have got before worrying about further reproduction. Wherever a wood is fully stocked, whether in a natural or artificial forest growth results in great destruction, and it is usually a forester's first aim and object so to regulate this destruction that the best and most valuable trees may reach maturity. Outside India it is recognised to be the height of folly to neglect thinnings in mixed woods, and in Burma although teak is well equipped for the struggle for life, we cannot expect more than a small proportion of the seedlings and saplings to reach maturity without assistance. Not only have we reproduction supplied free of charge, but the valuable species are distributed at such wide intervals that the waste inevitable in an artificial forest is avoided. We have, in fact, merely to remove species of no value to ensure that the majority of teak seedlings and saplings should reach maturity. Sylviculture in such forests is therefore very much more simple, and infinitely more profitable.

19. We have however large areas to deal with, and must therefore limit ourselves to the more pressing and useful works. Practical experience in carrying out improvement fellings (the form used to denote the rough thinnings practised in a natural forest), proves that it is possible to free all saplings and in many cases a large number of seedlings at small expense and to carry out the work over large areas. I maintain, therefore, that we could with advantage refrain from fire-protection and elaborate schemes for ensuring further reproduction, and should concentrate all our energies on carrying out this work on as short a rotation as possible. There can be no more effective way of increasing the growing stock of a species than by reducing the natural mortality to which it is subject, and there can, I think, be no doubt that it would result in a very great increase to the yield and that at a much earlier date than would be possible by any other

method. It is simple work and applicable to almost every forest, and it is, I believe, the only work of which no one disputes the value. I maintain also that although no special knowledge and no labour is required, further reproduction can be effected by this work, with more certainty and probably in greater quantity, than by any other method. I base my conclusion on the grounds which I do not think can be disputed, that ordinarily teak reproduction must increase in proportion with the number of saplings and seed-bearers saved from destruction by systematic improvement fellings. The elephant is known to be the slowest breeder of all known animals, and in order to illustrate the extraordinary effect of eliminating natural mortality, Darwin calculated that "after a period of from 740 to 750 years there would be nearly nineteen million elephants alive descended from the first pair." It is evident that exactly the same tendency to increase is displayed to a greater degree by a species such as teak. We, in fact, look after the saplings and seedlings already on the ground, and Nature does the rest. Could anything be more simple or more practical ?

Mr. Leete has given us rather a depressing picture of the state of the Pyinmana forests. One gathers that a time will come fortunately when we shall have retired to the place where all good Anglo-Indians go,—where in this, one of the finest Divisions in Burma, teak for girdling will be conspicuous by its absence. This is, however, no isolated case. We know that all our forests are steadily deteriorating under our management, and that our record thus far has been one of failure and incompetence. One may well ask "Is this the result of Scientific Forestry ? Have we not an uneasy suspicion that although we might be as wise as Solomon had we artificial forests to deal with, yet when it comes to the treatment of natural tropical forests we are mere children in knowledge ?" The moral would appear to be that we should not meddle with things we do not understand. The teak we are girdling now has grown up without fire-protection, and we know that protection is not essential. By all means let us start carrying out experiments and attempt to learn something about it, but in

the meantime would it not be wiser to leave it severely alone? In the same way I venture to think that we know nothing about reproduction. There is no urgent need to arrange the distribution of teak unnaturally nor to carry out elaborate schemes to ensure further reproduction, and would it not be wiser therefore to wait a bit until we have something more definite to go upon?

I do not hope to get any pension for years and years but when I retire my parting advice is going to be "Don't advance beyond your knowledge."

H. C. WALKER.

AKYAB:
September 1912.

NEGLECTED BURMA.

The following figures giving the forest revenue and expenditure for Burma and the rest of British India respectively for the year 1910-11 are instructive:—

	Revenue.	Expenditure.	Surplus.
	Rs.	Rs.	Rs.
Burma	1,00,70,117	38,42,799	62,27,318
Rest of India* (including Bombay, Madras and the Andamans).	1,73,22,595	1,10,48,295	62,74,300
Total ...	2,73,92,712	1,48,91,094	1,25,01,618
Add imperial receipts and charges ...	12,742	3,52,929	—3,40,187
Grand Total for British India ...	2,74,05,454	1,52,44,023	1,21,61,431

* This excludes imperial receipts and charges.

The percentage of expenditure of gross revenue works out at 38 per cent. for Burma and 64 per cent. for the rest of India. Considering that Burma already produces a surplus equal to that of all the rest of India combined, and that the potentialities of its forests are enormous, it is difficult to comprehend the suicidal policy of strangling the development of its magnificent forest resources.

THE TREATMENT OF "IN" AND "KANYIN" SLEEPERS WITH *AVENARIUS CARBOLINEUM.*

At the suggestion of the Forest Economist 400 In (*Dipterocarpus tuberculatus*) and 400 Kanyin (*Dipterocarpus alatus*) sleepers were prepared in the Pyinmana Division and treated at Pyinmana with *Avenarius Carbolineum* between 31st July and 14th August 1912.

2. A first attempt was made in June to boil the sleepers with an open fire under the tank; this ended disastrously, as the oil boiled over, caught fire and both sleepers and tank were considerably damaged.

3. After this four underground flues were built of brick and over these were placed four strong tanks each capable of taking four sleepers. This did away with the danger of the oil catching fire. The sleepers were placed in the tanks, by means of pulley chains attached from a beam which ran above the tanks along rails.

4. The treatment was carried out as follows:—

As soon as the oil reached a temperature of about 160° the sleepers were put in, 4 in each tank (16 in all), and allowed to boil for an hour at a temperature varying between 160° and 190°. The temperature was not allowed to go above 200° as the oil then expands and there is danger of boiling over. At the end of the hour the fires were withdrawn and the sleepers left for another hour in the cooling liquid. At the end of the second hour the sleepers were removed and a further supply put in.

5. During the experiment a number of sleepers were weighed before and after treatment in order to calculate the amount of oil absorbed.

The average absorption per Kanyin sleeper calculated on 72 sleepers was 1·11 lbs.; the average absorption per In sleeper calculated on 168 sleepers was also 1·11 lbs. At the end of the experiment the last 4 In sleepers instead of being taken out at the end of the second hour were left all night in order to ascertain if the absorption would materially increase. The result was surprising, the average absorption per sleeper being 9·4 lbs. These sleepers were in the cooling liquid for 19 hours. It remains to be seen whether the absorption of 1 lb. after an hour's cooling is sufficient to protect the sleeper from rot and insects for a considerable length of time. Probably six or eight hours in the liquid would give more satisfactory results.

6. It is very difficult to determine the cost of treatment from the experiment. There was of course much expenditure that would not be incurred in the ordinary way. It may be taken that the cost of extraction and conversion of In and Kanyin is very little less than that of Pyinkado. The price of In and Kanyin sleepers would therefore exceed the price of Pyinkado sleepers by the cost of the treatment.* Taking the price of *Avenarius Carbolineum* as 2·4 annas per lb., the price of an In or Kanyin sleeper treated with *Carbolineum* would be roughly 3 annas more than the price of a Pyinkado sleeper. The sleeper would have a much greater length of life to justify the extra cost. This we shall not know until the sleepers have been down on the line for several years.

A. P. DAVIS.

[*Provided the royalty of Kanyin and In was the same as that on Pyinkado which, in any case, is a superior sleeper wood than the former species.—HON. ED.]

CORRESPONDENCE.

TO THE HONORARY EDITOR, INDIAN FORESTER.

A PLEA FOR ECONOMIC FORESTRY.

SIR,—Dr. Blascheck's further article on the above subject in the August issue of the *Indian Forester* divides itself into two parts, namely, arguments in favour of adapting a financial rotation, and arguments in favour of more attention being paid to the principles of economics in Indian Forestry. Further discussion of the first point is of little value since it is easy to apply the test which Dr. Blascheck desires to any suitable Working Plan, and such a practical application would produce a sounder basis for arguments in favour of the adoption or rejection of a financial rotation than any amount of discussion based on theoretical figures. At present I remain unconvinced that, considering the few statistics for Indian forests available, there is anything to be gained from attempting to introduce a financial rotation ; and I do not think that an investigation of the rate of compound interest at which single trees are progressing will, when all circumstances are considered, provide reasons for altering present rotations. I think that Dr. Blascheck overstates his case when he says that, when working with the rotation of the highest mean annual increment, calculations based on single trees are *useless ;* and it is not impossible, as he seems to suggest (page 384, 3rd para.), to introduce into this method a correction for the reduction in area of the annual coupe with the increase in rotation. In the last paragraph of Dr. Blascheck's article he has entirely misapplied my remarks. What I said was, as may be seen by referring to my letter in your June number, that scientific forestry, including of course thinning operations, produces more trees of smaller girth in a certain time and that, as trees of a certain girth are necessary for technical reasons, I doubted if Dr. Blascheck was correct in supposing that present rotations could be reduced. The fact that thinnings

produce a larger total quantity of material does not affect the question.

As regards the other subjects of Dr. Blascheck's letter, the differences between us lie only in our ways of looking at things. Dr. Blascheck is an optimist ; he would probably describe me as a pessimist, whereas I, of course, imagine that I see things as they are. I should prefer to see an increase of the trained staff precede an attempt to demonstrate what scientific forestry on an economic basis can do.

M. R. K. JERRAM,
D. C. Forests.

AGAR-AGAR.

SIR,—On page 484 of the September number of the *Indian Forester* a mistake is made in referring Agar-Agar to an extract made from the wood of *Aquilaria agallocha*. Agar is not used in European medicine, but Agar-Agar, the substance referred to as a medicinal medium in the extract quoted, is a preparation from certain sea-weeds as *Gelidium cartilagineum*, Gaill., and *G. corneum*, Law., Ceylon Moss (*Gracillaria lichenoides*, Grer.) and other species. You will find a full account of these vegetable jellies in "Pharmacographia Indica," Vol. III, pp. 635—640.

Yours faithfully,
D. HOOPER.

[We are obliged to Mr. Hooper for the correction.—HON. ED.]

PRESERVATION OF GAME IN BURMA.

SIR,—As you have several times published articles on the question of Game Preservation in Burma, I enclose a leading article on the subject from a recent number of the *Rangoon Gazette*, in which the same measures are advocated as were unanimously recommended by the conference of Burma Forest Officers in June 1910. No action has yet been taken on these recommendations, although the Conference went so far as to draft

license forms embodying the proposed reforms, and it is difficult to see what reasons can be put forward by the authorities for declining to take action. The matter is becoming really urgent because the open jungles, in which the brow-antlered deer and other smaller animals were formerly found in large numbers, are steadily disappearing as cultivation advances, and the haunts of the larger game are every year becoming more easily accessible owing to the extension of the work of forest lessees and timber traders. "Threatening Gurkhas" with guns are not, fortunately, nearly so common in Burma as they are in the Dun, but it is possible that in the absence of any legal check, destruction of the same kind as the Dun forests suffer from, will become a right difficult to prevent. The magnificent forests of Burma are a delight to every one who visits them, and we may legitimately hope that they will become in time the resort of the practised sportsman who is accustomed, as in Africa, to obey the provisions of a permit, and abhors the methods of Colonel Roosevelt.

As your last correspondent on this subject said, the local Government does not need more power than it has under the present Forest Act and Rules, so let us induce it to use it for the benefit of posterity:

"It is a pity that more cannot be done for the preservation of game, both big and small, in Burma. There are, of course, certain laws and regulations on the subject, but as far as real protection goes, these are of no practical use, except perhaps in the case of wild elephants. At present no restriction is placed upon the shooting of any number of one species of big game in a season, but this is left entirely to the good feeling of those who shoot. There are, however, many who call and think themselves sportsmen who will ruthlessly kill five or six tsaing or bison in the course of a year, and many more who will kill twice that number of thamin. There is absolutely no excuse for this mere lust of blood, and if the authorities cannot see their way to do more than has at present been done to protect what ought to mean a real asset to the revenue, as it is in East Africa and many other countries, the censure of public opinion ought to be brought to

bear, and men of this stamp shown the disapproval of true sportsmen, and it is to be hoped of the community at large. Still a law, one would think, might be passed and enforced to regulate the number of head of each species which might be killed in a season, and also a license made necessary for the shooting of all big game wherever found, whether in a reserve or no. Even if the law should prove difficult to enforce, the fact of passing it would help to point out to those who at present apparently fail to realise it, the unsportsmanlike thing it is to shoot big game for the mere lust of killing, or still worse, in order to establish a record, of which they ought to be ashamed. At present the restrictions imposed against the killing of game within a forest reserve without a license and when out of season are practically a farce, in all districts that is where gun licenses are issued to natives. No ranger as a rule will dare to take a gun from a threatening Gurkha who is caught poaching or do more than perhaps report the matter without having obtained any clue to future identification. If a law prohibiting the sale of game when out of season was enforced and heavy fines imposed for any breach of it, there would be an end to the wholesale slaughter of deer and small game during the close time. The way in which jungle-fowl and francolin are shot off their nests and brought openly for sale in the bazaars by these native professional hunters, means the extinction of these birds in many districts, and it should be remembered that such a restriction as is suggested would not merely benefit the European, but the community at large."

"DAVE."

THE SAP OF THE NEEM TREE.

SIR,—About two months ago a Neem tree in the hospital compound here started exuding sap of a whitish colour very much in appearance like toddy. It had a strong odour of the ripe Neem fruit and was intoxicating in action as was evidenced by the swarms of drunken blue bottle flies crawling about on the tree where the sap was exuding.

This tree continued to exude about two pints of sap daily for nearly a month, and was largely resorted to by leperous persons who used to take the sap away in small pots which they hung up under the places from which the sap was exuding. They said it had the power of arresting the further development of the disease if taken internally.

Some wiseacres thought they had got an inexhaustible fountain of medicine and strong drink and tried to tap the tree for further supplies by driving large nails into it, but were sadly disappointed.

The excise people here when they heard of a Neem tree yielding toddy as it was commonly called by the natives began talking about bringing these trees under the Excise Act.

THAYETMYO :
5th September 1912. } D. A. ALLAN,
Extra Assistant Conservator of Forests.

A SUGGESTION FOR THE IMPROVEMENT OF THE STATUS OF, AND PENSION RULES FOR, PROVINCIAL FOREST SERVICE OFFICERS.

SIR,—The context of the letter signed " Dives " which appeared in the *Indian Forester* for August 1912, holds equally good for the Provincial Forest Service, both as regards pay and pension rules. The new scheme sanctioned last year for the Provincial Forest Service is indeed a great improvement over the old system for which the thanks of the Service are due to Government, but a further improvement in the scheme is called for if we compare the scheme recently sanctioned for the Provincial Service of the Public Works Department. The duties which a Forest Officer has to perform are, no one will deny, much harder than those of an Engineer, and the Forester deserves further consideration if we take into account the fact that he has to work in unhealthy and out-of-the-way places at very much greater sacrifice of health and personal comforts.

Similarly, owing to their having spent the best part of their lives in forests under very trying conditions, there are very few who survive for their pension.

I therefore suggest that a request to Government, who have already done so much for us, be made :—

1. To raise the status of the Provincial Forest Service to that of the same branch of the P. W. D. It will be observed from a perusal of the schemes of the letter that they reach Rs. 850 in twenty years by getting more in their annual increments than we do, while we cannot aspire to this until we are at the verge of retirement.

2. That pension should be allowed to us as follows :—

After completing 15 years' service one-third of average emoluments.

After completing 20 to 25 years' service half of average emoluments.

I should be glad to know of the views of others also on the subject.

"A PROVINCIAL."

PROTECTION OF WILD LIFE.

The following is the Bill to make better provision for the protection and preservation of certain wild birds and animals.

Whereas it is expedient to make better provision for the protection and preservation of certain wild birds and animals ; it is hereby enacted as follows :—

SHORT TITLE AND EXTENT.

1. (*1*) This Act may be called the Wild Birds and Animals Protection Act, 1912 ; and

(*2*) It extends to the whole of British India, including British Baluchistan, the Santhal Parganas and the Pargana of Spiti.

APPLICATION OF ACT.

2. (*1*) This Act applies, in the first instance, to the birds and animals specified in the Schedule, when in their wild state.

(*2*) The Local Government may, by notification in the local official *Gazette*, apply the provisions of this Act to any kind of wild bird or animal, other than those specified in the Schedule, which, in its opinion, it is desirable to protect or preserve.

CLOSE TIME.

3. The Local Government may, by notification in the local official *Gazette*, declare the whole year or any part thereof to be a close time throughout the whole or any part of its territories for any kind of wild bird or animal to which this Act applies, or for female or immature wild birds or animals of such kind ; and subject to the provisions hereinafter contained, during such close time and within the areas specified in such notification, it shall be unlawful—

(*a*) to capture any such bird or animal, or to kill any such bird or animal which has not been captured before the commencement of such close time ;

(*b*) to sell or buy, or offer to sell or buy, or to possess, any such bird or animal which has not been captured or killed before the commencement of such close time, or the flesh thereof ;

(*c*) if any plumage has been taken from any such bird captured or killed during such time, to sell or buy, or to offer to sell or buy, such plumage.

PENALTIES.

4. (*1*) Whoever does, or attempts to do, an act in contravention of section 3, shall be punishable with fine which may extend to fifty rupees.

(*2*) Whoever, having already been convicted of an offence under this section, is again convicted thereunder shall, on every subsequent conviction, be punishable with imprisonment for a term which may extend to one month, or with fine which may extend to one hundred rupees, or with both.

CONFISCATION.

5. (*1*) When any person is convicted of an offence punishable under this Act, the convicting Magistrate may direct that any bird or animal in respect of which such offence has been committed,

or the flesh or any other part of such bird or animal shall be confiscated.

(2) Such confiscation may be in addition to the other punishment provided by section 4 for such offence.

COGNIZANCE OF OFFENCES.

6. No Court inferior to that of a Presidency Magistrate or a Magistrate of the second class shall try any offence against this Act.

POWER TO GRANT EXEMPTION.

7. Where the local Government is of opinion that, in the interests of scientific research, such a course is desirable, it may grant to any person a license, subject to such restrictions and conditions as it may impose entitling the holder thereof to do any act which is by section 3 declared to be unlawful.

SAVINGS.

8. Nothing in this Act shall be deemed to apply to the capture or killing of a wild animal by any person in defence of himself or any other person, or to the capture or killing of any wild bird or animal in *bonâ fide* defence of property.

REPEAL.

9. The Wild Birds Protection Act, 1887, is hereby repealed.

THE SCHEDULE.

(*i*) Bustards, ducks, floricans, jungle-fowl, partridges, pea-fowl, pheasants, pigeons, quail, sand-grouse, painted snipe, spurfowl, woodcock, herons, egrets, rollers and king-fishers.

(*ii*) Antelopes, asses, bison, buffaloes, deer, gazelles, goats, hares, oxen, rhinoceroses and sheep.

EXCAVATING A BURIED FOREST.

BY D. W. O. FAGAN.

Amid encircling hills, twenty miles south from Auckland, lies the wide expanse of the great Papakura Valley. Level as a billiard-table, covering an area of many thousand acres, the vast flat stretches away and away till it is merged in the blue distance of

the horizon. In reality the valley is a huge peat-swamp, partially dry in places, probably because of natural evaporation. Elsewhere, where artificially drained, it already carries smiling homesteads of rich pasture-land, and it needs no prophetic eye to see in the near future the whole expanse converted into meadow-land by the dairy-farmer. Meanwhile it is a scene of industry probably unique of its kind in the whole history of man's operations. Beneath the surface of the peat, where the soil has shrunk in drying or has been blown away, lie exposed to view the trunks of innumerable kauri-trees.

Their submersion for centuries in the semi-liquid peat has sufficed for the decay and disappearance of branches and crowns. Nothing but the solid heart-wood of the mighty trunks remains, and these are found lying in orderly swathes almost as regular in alignment as wheatstalk on a newly-reaped field. Scarce a trunk is out of rank. The thousand heads point all in one direction, as though the forest had originally fallen under the sickle of some careful reaper.

There is a mystery about these huge trees. How came they here? Not thrown higgledy-piggledy in inextricable confusion, as has been found to be the case in the uncovering of other buried forests, but each as truly placed as ever fell living tree under the axe of the timber-getter. Did the forest that once covered the wide valley fall at a blow before the scythe-stroke of some cyclonic giant of primeval days that roared its way among the hills? Or was there never a forest at all, and did the present flat once form the floor of an old lake or ocean-inlet, into which, singly or in twos and threes, the great trees were drifted through the ages by flood or tide? The solution of the problem opens a wide field of conjecture.

The recovery and utilisation of buried timber is no new thing among the host of the world's strange industries. For some hundreds of years the wood of buried and submerged trees from avalanche-filled valley or mountain lake has been recovered and worked among the Swiss Alps. Many a yeoman-farmer or squire of the western counties can point with pride to heirloom cabinet or carved four-poster of black bog-oak. In parts of Devon and

Somerset, I believe, it is still possible to come across old-world churches and even cottages floored and raftered with age-old timber dug from the hags of Exmoor and Dartmoor.

It may be doubted, however, if elsewhere in the world it is possible to find, duplicated in one spot, so huge an area of buried timber of such immense size, and at the same time offering such facilities of recovery. Certainly in no other country has the conversion of a prehistoric forest into marketable timber been attempted on so wholesale a basis, or with better promise of success. A company has recently acquired the right of timber-recovery over some thousands of acres, and their mill is already at work cutting the huge trees into planks and logs.

There is not much in the working of an ordinary lumber-mill with which the average magazine reader is not familiar. Here, however, one strikes a note of newness, even of romance. Of peculiarly stunted growth must needs be the imagination of the spectator who, watching the log-laden trolleys swing in on the tram-rails, does not confess a thrill of interested emotion!

How many ages have gone by since this huge twelve-foot log, with the mud and grime of centuries thick upon it, reared its high head among its forest compeers? How many cycles passed above its waving crown—passed and slipped into Time's forgotten gulf—ere came the final cataclysm that laid it low? Did the brooding moa scoop a nest-burrow among its huge root-buttresses? Could it speak, would it tell us of that legendary race of men who left the carved stone coffins in our caves and wrought the basalt columns that strew our hillsides? By what strange hap of Nature's chemistry has the age old wood been preserved in all its primeval soundness to furnish weatherboard and scantling to a modern world?

The kauri is not a Scotch fir or Norway pine. The great trees require elbow-room, and in living forests are widely apart, amid the undergrowth. But the thickness of the one-time growth of huge trees covering the flat may be judged by the amount of fallen timber embedded in the peat.

The estimated quantity of visible and millable timber per hundred acres of the area is computed at ten million superficial

feet, and beneath the surface, to a depth of thirty feet, the great balks are found in the same ratio of closeness.

Some idea of the immense size of the old trees is furnished by measurements of the solid heartcores now remaining. As in the case of branches and crowns, the softer sap-wood that once enwrapped the central cores of the living trees has long since disappeared ; so in arriving at a computation of former size a considerable addition to present measurements must be made. Many of the logs, as now found, show a girth of over sixty feet, by a length of eighty or ninety feet of straight timber free from knot or branch. The average measurement may be put at from thirty-five to forty feet in circumference, and hardly any of the trunks show a diameter of less than eight feet.

Everywhere about the swamp one sees signs of excavation where workmen are delving to uncover the timber, and very interesting is the manner in which it is unearthed and got ready for the mill. Pits are scooped in the peat on each side of the trunk, as it lies, to accommodate the sawyers. Working in these, and wielding huge cross-cut saws, the men cut the eighty-foot balks into lengths of twelve or twenty feet. Then the grips of a 'forest-devil' are brought into play, actuating a wire rope or massive chain with a lifting power of sixty tons. There is a rattle and clank of machines, a groan and strain of pulleys, and a coughing roar of steam—a strange sucking sound, like the kiss of a long farewell. The black lips of the peat roll back, the great log is torn from the embrace of centuries, swung up on to bullock tram or trolley, and hauled away on its last journey to the saw-benches.

The cut timber is perfectly sound and of excellent quality. It differs from kauri timber of to-day cut from the living tree only in the matter of colour, which is a dark-reddish brown approaching mahogany. It is perhaps too early to speak of its lasting qualities ; but, following on its long subjection to the preservative action of the peat, many experts have expressed an opinion that the wood should prove practically indestructible. At all events, to use an Americanism, Papakura Valley timber has 'caught on,' and a trade has been opened with the British markets. Already

the unique industry has passed beyond the region of problematical success.

Much diverse guessing has taken place as to the probable age of the wood now being utilised. It has been variously stated at from two to three thousand years. The kauri-tree is of slow growth, requiring a lapse of a thousand years ere maturity is reached. Geology points to the fact that the peat morass now filling the valley has endured for at least another ten centuries; and if we add, say, five hundred years for the mature life of the forest ere its destruction, it is probable, in the case of the larger timber, that the estimate is fairly correct.

A wonderful place this swamp of the Papakura Valley, and—with the exception of some of the more famous goldfields—unsurpassed for wealth of natural production, area for area, by any place on earth. The peat is full of fossil gum, shed through unnumbered centuries by the trees that are now being dug out and utilised. Since the dawn of the gum-digging era, forty years ago, the value of the fossil resin recovered amounts to many hundreds of thousands of pounds. At the present day it is still being won in increasing quantity; and as the timber is removed and the work of drainage progresses, it is confidently expected that, rich as the return has been in the past, it is not a moiety of what the future may be expected to yield. In not a few parts of the area as many as five successive layers of gum have been found at varying depths beneath the surface—a fact that would seem to point to the supposition that in past ages forest after forest has grown, flourished, and passed away.

The valley presents a busy scene. Side by side with the excavations of the timber-workers are the deep pits of the gum-diggers. Gangs of men are hard at work grubbing out the precious lumps of resin from the black soil; others throw out the soakage of the all-pervading water with bailing-bucket or Californian pump.

Fifty pounds an acre is freely offered to the lucky farmer or settler-owner of a bit of swampland, with a royalty on all gum produced, for the right of digging and prospecting. It is a prosperous wind now blowing for the farmers of the valley. At the end

of operations, the lessor, in addition to the consideration, which may very well reach a considerable figure, takes back his land markedly improved and enhanced in value by the deep digging necessary for the recovery of the resin ; and all this, of course, without any effort or expenditure on his part.—[*Chamber's Journal.*]

"THE LARGEST PIECE OF RUBBER."

In our last issue we asked if any of our readers knew of the largest piece of raw rubber on record. We referred to a biscuit weighing 559 lbs., which was exhibited at the Rubber Exhibition of 1908, and also to a block which figured at several tyre exhibitions, and weighed about 8 cwt. This week we are enabled, by the courtesy of the St. Helen's Cable and Rubber Co., Ltd., Warrington and London, to publish a photograph of a piece of Fine Hard Para which they bought about five or six years ago. This block weighed nearly half-a-ton, to be exact 1,100 lbs., and was shown at several exhibitions about the country. It is claimed that this is the largest piece of rubber ever imported.—[*India Rubber Journal.*]

GAZETTE NOTIFICATIONS.

1.—Government of India Gazette.

26th October 1911.—No. 1020—171-7-F.—With reference to the notification of this Department No. 743—171-3-F., dated the 15th August 1911, Mr. B. B. Osmaston, Conservator of Forests, 3rd, officiating 2nd, grade, was relieved by Mr. P. H. Clutterbuck, Deputy Conservator of Forests, on the afternoon of 10th October 1911 of the charge of the Eastern Circle, United Provinces.

From the same date Mr. Clutterbuck is appointed to officiate as Conservator of Forests, 3rd grade, in charge of the Eastern Circle, United Provinces, until further orders.

27th October 1911.—No. 1025—140-6-F—On return from privilege leave Mr. G. S. Hart, Chief Conservator of Forests, resumed charge of the office of Chief Conservator of Forests, Central Provinces, with effect from the forenoon of 21st October 1911.

From the same date Mr. H. H. Haines, officiating Chief Conservator of Forests, Central Provinces, reverted to his substantive appointment of Conservator of Forests, 3rd grade.

No. 1027—140-7-F.—With reference to the notification of this Department No. 889—171-5-F., dated 26th September 1911, Mr. H. H. Haines, Conservator of Forests, 3rd grade, is appointed to officiate as Conservator of Forests, 2nd grade, with effect from the 21st October 1911.

From the same date Mr. A. V. Monro, Conservator of Forests, 3rd (officiating 2nd) grade, reverted to his substantive appointment.

13th November 1911.—No. 1091—198-5-F.—Dr. A. D. Imms of the Indian Educational Service is appointed to be Forest Zoologist at the Forest Research Institute and College, Dehra Dun, on probation for one year, with effect from the forenoon of 30th October 1911, the date on which he relieved Mr. R. S. Hole, Forest Botanist, of the additional charge of that post.

13th November 1911.—No. 1274-244-4.—Mr. J. D. Maitland-Kirwan, Deputy Conservator of Forests, Bombay Presidency, and Instructor at the Forest College, Dehra Dun, is granted privilege leave for 3 months combined with furlough for 9 months, with effect from the afternoon of 31st October 1911.

From the same date Mr. A. Rodger, Deputy Conservator of Forests, Burma, and Forest Economist, is appointed to be Instructor at the Forest College in addition to his own duties until further orders.

21st November 1911.—No. 1114—240-9-F.—The following transfers are made :

1. Mr. J. L. Baker, Deputy Conservator of Forests, from Bengal to the Andamans.
2. Sir H. A. Farrington, Bart., Deputy Conservator of Forests, from the Andamans to Bengal.

24th November 1911.—No. 985.—Mr. J. L. Baker, Deputy Conservator of Forests, Port Blair, is appointed to be an Assistant Superintendent in the Settlement so long as he holds his present office or until further orders.

2.—Madras Gazette.

20th October 1911.—*Leave.*—Under article 260 of the Civil Service Regulations, the Board grants Mr. J. A. Daly, District Forest Officer, North Cuddapah, privilege leave for twelve days from the 13th to the 24th December 1911, both days inclusive.

Posting.—M. R. Ry. V. Subramania Aiyar, Extra Assistant Conservator of Forests, is, on his return from leave, posted to do duty under Mr. Lodge.

30th October 1911.—No. 479.—The following postings of Forest Officers are ordered :—

(1) Mr. Francis Cowley Loftus Cowley-Brown, Deputy Conservator of Forests, on return from leave, to be District Forest Officer, North Salem Division.

(2) M. R. Rv. Coimbatore Muthuswami Maduranavagam Pillai, District Forest Officer, North Salem Division, to be District Forest Officer, South Salem Division

(3 Mr Thomas Clear, Assistant Conservator of Forests and District Forest Officer, South Salem Division, to do duty under the District Forest Officer, North Salem Division

6th November 1911.—No. 488.—The following postings of Forest Officers are ordered :—

Mr. Arthur Bushe Jackson. Deputy Conservator of Forests, on return from leave, to be District Forest Officer, Chittoor.

Saiyid Burhan-ud-din Husain Sahib Bahadur, Khan Sahib, Extra Deputy Conservator of Forests and District Forest Officer, Chittoor, to be District Forest Officer, Nellore

16th November 1911.—No. 510.—The following postings of Forest Officers are ordered :

Mr. R. Bourne. Assistant Conservator of Forests, to do duty under the District Forest Officer, North Coimbatore Division

18th November 1911.—Mr Horace Bransby Bryant, Deputy Conservator of Forests and Acting Conservator of Forests, Central Circle, *to be* District Forest Officer, Madura, and to hold charge of Ramnad also.

Mr Cecil Earnest Claude Fischer, District Forest Officer, Madura, *to be* District Forest Officer, South Coimbatore.

3.—Bombay Gazette.

18th October 1911.—No. 2787.—Messrs. G. R. Duxbury, Divisional Forest Officer, South Nasik, and H. A. Bhadbhade, Extra Assistant Conservator of Forests, respectively delivered over and received charge of the Sub-Divisional Forest Office, South Nasik, on the forenoon of 3rd October 1911.

20th October 1911.—No. 9900.—His Excellency the Governor in Council is pleased to appoint Mr. G. S. Butterworth, on return to duty, to be Divisional Forest Officer, S. D. Kanara

No. 9901.—His Excellency the Governor in Council is pleased to appoint Mr. E. M. Hodgson, on return from leave, to be Divisional Forest Officer, Belgaum.

26th October 1911.—No. 4493.—Mr. G. J. Rege, Extra Assistant Conservator of Forests and Sub-Divisional Forest Officer, Kanara, Southern Division, availed himself of the two months' and twenty days' privilege leave, sanctioned in Government Notification No. 8746, dated 19th September 1911, from the 4th October 1911, handing over charge of his office to Mr. A. G. Edie, Deputy Conservator of Forests and Divisional Forest Officer, Kanara, Southern Division, on the afternoon of 3rd October 1911.

27th October 1911.—No. 2914.—Dr. N. Gustasp, Divisional Forest Officer, West Khandesh, and Mr V. R. Mirchandani, Extra Assistant Conservator of Forests, respectively delivered over and received charge of the Sub-Division Forest Office, West Khandesh, on the afternoon of 16th October 1911.

No. 2915.—Dr. N. Gustasp and Mr J. Hamilton, Assistant Conservators of Forests, respectively delivered over and received charge of the Divisional Forest Office, West Khandesh, on the afternoon of the 17th October 1911.

30th October 1911.—No 4609 Messrs. A. G. Edie, Deputy Conservator of Forests and Divisional Forest Officer, Kanara Southern Division, and A. C. Hiley, Assistant Conservator of Forests, respectively delivered over and received charge of the Sub-Divisional Forest Office, Kanara Southern Division, on the forenoon of the 25th October 1911

3rd November 1911.—No 10340.—Mr. W. A. Wallinger, Extra Deputy Conservator of Forests and Divisional Forest Officer, Satara, is granted such privilege leave as may be due to him on 11th November 1911, or the subsequent date on which he may be relieved, in combination with furlough for ten months.

7th November 1911.—No 10459.—Mr. D. R. S. Bourke, Assistant Conservator of Forests, has been allowed by His Majesty's Secretary of State for India to return to duty.

No. 10466.—Mr. D. R. S. Bourke, Assistant Conservator of Forests, has been allowed by His Majesty's Secretary of State for India an extension of leave on medical certificate for three days.

11th November 1911.—No. 2351.— Mr. L. Napier, Acting Conservator of Forests, delivered over and Mr. W. F. D. Fisher, Acting Conservator of Forests, received charge of the Direction Division, Northern Circle, on the 10th day of November 1911 in the forenoon.

14th November 1911.—No. 3173.—Messrs. N. D. Satarawala, L.C.E., Extra Deputy Conservator of Forests., and E. G. Oliver, Deputy Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, Poona, on the afternoon of the 4th November 1911.

15th November 1911.—No. 3204.—Messrs. W. A. Wallinger and N. D. Satarawala, L.C.E., Extra Deputy Conservators of Forests, respectively delivered over and received charge of the Divisional Forest Office, Satara, in the afternoon of 10th November 1911.

18th November 1911.—No. 3145.—Messrs. S. P. Limaye Extra Assistant Conservator of Forests, and J. Dodgson, Deputy Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, North Khandesh, on the forenoon of the 4th November 1911.

4.—Bengal Gazette.

No. 13-*Forests.*—*The 26th October* 1911.—Mr. E. R. Comber, Extra Assistant Conservator of Forests, is granted six weeks' privilege leave in extension of the leave granted in this office Notification No. 4-Forests, dated 1st August 1911.

No. 14 *Forests.*—*The 28th October* 1911.—Mr. H. T. Lewis, Assistant Conservator of Forests attached to Singhbhum Forest Division, is transferred temporarily to the charge of the Kurseong Forest Division and the Directorship of the Kurseong Forest School in place of Mr. J. L. Baker, Deputy Conservator of Forests, whose services have been placed at the disposal of the Government of India for employment in the Andamans.

No. 5-*Forests*—*The 17th* November 1911.—Sir H. A. Farrington, Bart., Deputy Conservator of Forests, on transfer from the Andamans, is posted to the charge of the Kurseong Forest Division and the Directorship of the Kurseong Forest School

No. 16-*Forests*.—The *17th November* 1911.—Mr. H. T. Lewis, Assistant Conservator of Forests, on relief by Sir H. A. Farrington, Bart., Deputy Conservator of Forests, is transferred to Singhbhum Forest Division as an attached officer with head-quarters at Chaibassa.

5.—Eastern Bengal and Assam Gazette.

19th October 1911.—No. 5343-F.—Mr. J. S. Owden, Assistant Conservator of Forests, attached to the Direction Division, Eastern Circle, is transferred to Dibrugarh and attached to the Lakhimpur Forest Division.

19th October 1911.—No. 5344-F.—Mr. Tara Kesore Gupta, Extra Assistant Conservator of Forests, attached to the Cachar Forest Division, is temporarily appointed to hold charge of that Division.

19th October 1911.—No. 5345-F.—Mr. A. J. W. Milroy, Assistant Conservator of Forests, in charge of the Cachar Forest Division, is attached to the Jalpaiguri Forest Division on being relieved by Mr. Tara Kesore Gupta.

19th October 1911.—No. 5340-F.—Mr. L. E. S. Teague, Deputy Conservator of Forests, on return to duty, is appointed to hold charge of the Cachar Forest Division.

20th October 1911.—No. 5514-F.—Mr. H. L. Cooper, Assistant Conservator of Forests, on return from leave, is appointed to hold charge of Chittagong Hill Tracts Forest Division.

20th October 1911.—No. 5515-F.—Mr. Ram Nath Mukharji, Extra Assistant Conservator of Forests, in charge of the Chittagong Hill Tracts Forest Division, is deputed to hold charge of the Provincial Forest Training Class, for six months, with effect from the 15th October 1911.

8th November 1911.—No. 43-F.D.—The following notification issued by the Government of India in the Department of Revenue and Agriculture is republished :—

No. 1027-F.—140-7, dated the 27th October 1911.—With reference to the notification of this Department No. 889-F.—175-5, dated the 26th September 1911, Mr. H. H. Haines, Conservator of Forests, 3rd grade, is appointed to officiate as Conservator of Forests, 2nd grade, with effect from the 21st October 1911.

From the same date Mr. A. V. Monro, Conservator of Forests, 3rd (officiating 2nd) grade, reverted to his substantive appointment.

6.—United Provinces Gazette.

26th October 1911.—No. 1020–171-7-F—With reference to the notification of this Department No. 743-171-3-F., dated the 15th August 1911, Mr. B. B. Osmaston, Conservator of Foresrs, 3rd, officiating 2nd, grade, was relieved by Mr. P. H. Clutterbuck, Deputy Conservator of Forests, on the afternoon of 10th October 1911 of the charge of the Eastern Circle, United Provinces.

From the same date Mr. Clutterbuck is appointed to officiate as Conservator of Forests, 3rd grade, in charge of the Eastern Circle, United Provinces, until further orders.

7th November 1911.—No. 6.—Pandit Shambhu Datt Joshi, Officating Extra Assistant Conservator of Forests, while proceeding to the Chakrata Forest Division of the Western Circle as an attached officer, under the order of the Conservator of Forests, No. 12, dated the 11th February 1911, was placed on special duty on the 24th February 1911.

13th November 1911.—No. 1091—198-5-F.—Dr. A. D. Imms of the Indian Educational Service is appointed to be Forest Zoologist at the Forest Research Institute and College, Dehra Dun, on probation for one year, with effect from the forenoon of 30th October 1911, the date on which he relieved Mr. R. S. Hole, Forest Botanist, of the additional charge of that post.

7.—Punjab Gazette.

25th October 1911.—No. 506.—Notification.—Mr. B. O. Coventry, Deputy Conservator of Forests, and Pandit Gokal Das, Extra Deputy Conservator of Forests, respectively made over and received charge of the Lahore Forest Division on the afternoon of the 7th September 1911, and from the same date Mr. B. O. Coventry, Deputy Conservator of Forests, will remain in charge of the Direction Division.

No. 509.—Notification.—Consequent on his transfer from the Bashahr Forest Division to the Simla Forest Division, Mr. H. L. Wright, Assistant Conservator of Forests, made over charge of his duties as an attached officer in Bashahr Division on the forenoon of the 30th August 1911, and took over charge of his duties as an attached officer at Simla on the forenoon of 1st September 1911.

No. 512. Notification.—Pandit Gokal Das, Extra Deputy Conservator of Forests, and Mr. H. L. Wright, Assistant Conservator of Forests, respectively made over and received charge of the Simla Forest Division on the afternoon of the 5th September 1911, consequent on the former's transfer to the Lahore Forest Division.

7th November 1911.—No. 547.—Notification.—Lalas Daulat Ram, B.A., and Sundar Das, Extra Assistant Conservators of Forests, respectively received and made over charge of the Multan and Pir Mahal Forest Divisions on the afternoon of the 12th October 1911.

2. From the same date Lala Sundar Das is transferred to the Direction Division as an attached officer

11th November 1911.—No. 561.—Notification.—On return from 6 months' combined leave granted him in Punjab Government Notification No. 304 Forests), dated 6th June 1911, Mr. R. N. Parker, Deputy Conservator of Forests, reported himself at Bombay on the forenoon of the 13th and at the office of the Conservator of Forests Punjab, Lahore, on the forenoon of the 16th October 1911, from which date he is attached to the Direction Division.

The 16th November 1911.—No 580.—Notification—Consequent on his transfer from the Rawalpindi to the Direction Division, Mr. L. B. Holland, Assistant Conservtaor of Forests, made over charge of his duties at Rawalpindi on the afternoon of the 13th October 1911, and assumed charge of his duties in the Direction Division as an attached officer on the forenoon of the 14th October 1911.

8.—Central Provinces Gazette.

26th October 1911.—No. 1879.—On return from the combined leave granted him by Order No. 845, dated the 25th April 1911, Mr. C. E. C. Cox, Assistant Conservator of Forests, is reposted to the Hoshangabad Forest Division.

27th October 1911.—No. 1886.—On return from the combined leave granted him by Order No. 432, dated the 7th March 1911, Mr. C. A. V. Malcolm, Deputy Conservator of Forests, is reposted to the charge of the Yeotmal Forest Division.

No. 1887.—On relief by Mr. Malcolm, of the charge of the Yeotmal Forest Division, Mr. Pandurang Narayan, Extra Assistant Conservator of Forests, will remain attached to that Division

No 1930. —On return from the combined leave granted him by Orders No. 966, dated the 16th April 1910, No. 582, dated the 23rd March 1911, and No. 1418, dated the 28th July 1911, Mr. V. G. Morgan, Deputy Conservator of Forests, is posted to the charge of the Chhindwara Forest Division.

No. 1931.—On relief by Mr. Morgan, of the charge of the Chhindwara Forest Division, Mr J. Carr, Assistant Conservator of Forests, will remain attached to that Division.

9.—Burma Gazette.

10th October 1911.—No. 29—With reference to Reveuue (Forest) Department Notifications Nos. 130 and 131 of 25th July 1911, and in continuation of this office Notification No. 23 of the 7th August 1911, Mr. E. M. Buchanan, Extra Deputy Conservator of Forests, returned from the two months' privilege leave on the afternoon of the 2nd October 1911, and on the same date received charge of the Myitkyina Forest Division from Mr. H R. Blanford, Deputy Conservator of Forests.

17th October 1911.—No. 163 —Mr. A. H. M. Barrington, Assistant Conservator of Forests, in charge of the Thaungyin Forest Division, is transferred from Moulmein and is reposted to Working-plans duty in the Pegu Forest Division.

No. 164.—Mr. G. F. R. Blackwell Thurling, Deputy Conservator of Forests in charge of the Ataran Forest Division, is appointed to the charge of the Thaungyin Forest Division, as a temporary measure in addition to his own duties in place of Mr. A. H. M. Barrington, Assistant Conservator of Forests, transferred.

No. 165.—Under the provisions of Articles 233, 260 and 308 (*b* of the Civil Service Regulations, privilege leave for three months and furlough for nine months in continuation thereof is granted to Mr. F. H. Todd, Deputy Conservator of Forests, in charge of the Mandalay Forest Division, with effect from the 28th October 1911, or the subsequent date on which he may avail himself of the privilege leave

16th October 1911.—No. 28.—With reference to Revenue (Forest) Department Notifications Nos. 152 and 153, dated the 6th September 1911, Mr. C B. Smales, Deputy Conservator of Forests, made over and Mr. G. R. Jeffery, Deputy Conservator of Forests, received charge of the Prome Forest Division, on the forenoon of the 10th October 1911.

18th October 1911.—No. 35 – With reference to Revenue (Forest) Department Notification No. 155, dated the 20th September 1911, Mr. G H. A. Goldberg, Assistant Conservator of Forests, assumed charge of his special duty in connection with measuring timber at Pakôkku in the Yaw Forest Division on the forenoon of the 22nd September 1911.

19th October 1911.—No 29.—With reference to Revenue (Forest) Department Notification No 157, dated the 28th September 1911, Mr. T. W. Forester, Extra Deputy Conservator of Forests, made over and Mr. C. W. Allan, Extra Deputy Conservator of Forests, received charge of the Henzada-Ma-ubin Forest Division on the forenoon of the 10th October 1911.

No. 30 – With reference to this office Notification No 27, dated the 8th September 1911, Mr. C. E. Milner, Assistant Conservator of Forests, relinquished charge of his duties in connection with measuring timber in the Mandalay Depôt Division on the afternoon of the 7th October 1911.

20th October 1911.—No. 36.—With reference to Revenue (Forest) Department No. 160, dated the 30th September 1911, Mr. F. W. Collings, Deputy Conservator Forests. was placed on special duty in the Yaw Forest Division from the afternoon 7th to the afternoon of 15th September 1911 in connection with measuring timber a Pakôkku.

No. 166.—On return from leave Mr. R. L. Pocock, Extra Deputy Conservator of Forests is reposted to the charge of the South Tenasserim Forest Division, in place of Mr. C G. E. Dawkins, Assistant Conservator of Forests, transferred.

No. 167.—On relief by Mr. R. L. Pocock, Extra Deputy Conservator of Forests, Mr. C. G. E. Dawkins, Assistant Conservator of Forests, in charge of the South

Tenasserim Forest Division, is transferred from Tavoy and is posted to the charge of the Gangaw Forest Sub-division, Yaw Forest Division.

No. 168.—On return from leave Mr. F. A. Reich, Extra Assistant Conservator of Forests, is posted to duty in the West Salween Forest Division.

23rd October 1911.—No. 37.—Mr. W. F. L. Tottenham, Deputy Conservator of Forests, made over and Mr. H. W A. Watson, Deputy Conservator Forests, received charge of the Ruby Mines Forest Division, on the afternoon of the 20th October 1911.

24th October 1911.—No. 30. With reference to Revenue Forest Department Notification No. 158, dated the 28th September 1911, Mr. T. W. Forster, Extra Deputy Conservator of Forests, assumed charge of his duties in the Thayetmyo Forest Division, on the forenoon of the 16th October 1911.

25th October 1911.—No. 38.—Messrs. J. V. Young, Assistant Conservator of Forests, made over and F. A. Leete, Deputy Conservator of Forests, on return from one month's privilege leave granted him in Revenue (Forest) Department Notification No. 149, dated the 5th September 1911, received charge of the Pyinmana Forest Division on the afternoon of 21st October 1911.

26th October 1911.—No. 184.—Mr. H. W. A. Watson, Deputy Conservator of Forests, in charge of the Southern Shan States Forest Division, is transferred from Taunggyi and is posted to the charge of the Ruby Mines Forest Division in place of Mr. W. F. L. Tottenham, Deputy Conservator of Forests, transferred

No. 185.—Mr. W. A. Robertson, Assistant Conservator of Forests, in charge of the Bampon Forest Sub-division, Southern Shan States Forest Division, is placed in charge of the Southern Shan States Forest Division in addition to his own duties as a temporary measure in place of Mr. H. W. A. Watson, Deputy Conservator of Forests transferred.

No. 186.—On return from leave Mr. A. E. Ross, Deputy Conservator of Forests, is posted to the charge of the Southern Shan States Forest Division in place of Mr. W. A. Robertson, Assistant Conservator of Forests, who remains in charge of Bampon Forest Sub-division, Southern Shan States Forest Division.

27th October 1911.—No 187.—Mr. W. F. L Tottenham, Deputy Conservator of Forests, in charge of the Ruby Mines Forest Division who has been appointed to officiate as a Conservator, is transferred from Mogôk and is posted to the charge of the Southern Forest Circle in place of Mr. E. S. Carr, Conservator of Forests, transferred.

No. 188.—On relief by Mr. W. F. L. Tottenham, Deputy Conservator of Forests, Mr. E. S Carr, Conservator of Forests, in charge of the Southern Circle, is transferred from Maymyo and is posted to the charge of the Tenasserim Forests Circle in place of Mr. J Copeland, Conservator of Forests, transferred

No. 189.—Mr. G. F. Mathews, Extra Assistant Conservator of Forests, attached to the Mandalay Forest Division, is placed in charge of that Division in addition to his own duties as a temporary measure in place of Mr. F. H. Todd, Deputy Conservator of Forests, proceeding on leave.

No. 190.—Under the provisions of Articles 233, 260 and 308 *b*) of the Civil Service Regulations, privilege leave for one month and twenty-four days and furlough for eleven months in continuation thereof is granted to Mr. C R. Dun, Deputy Conservator of Forests, in charge of the Pegu Forest Division, with effect from the date on which he may avail himself of the privilege leave.

No. 191.—On return from leave Mr. F. Linnell, Deputy Conservator of Forests, is posted to the charge of the Pegu Forest Division in place of Mr. C. R. Dun, Deputy Conservator of Forests, proceeding on leave.

30th October 1911.—No. 194.—Mr. W. A. Robertson, Assistant Conservator of Forests, in charge of the Bampon Forest Sub-division, Southern Shan Sates Forest Division, is transferred from Loilem and is posted to the charge of the Mandalay Forest Division in place of Mr G. F. Mathews, Extra Assistant Conservator of Forests, who remains attached to the Mandalay Forest Division.

No. 195. The Lieutenant-Governor appoints Mr. J. V Young, Assistant Conservator of Forests, attached to the Pyinmana Forest Division, to succeed the Divisional Forest Officer, Pyinmana Forest Division, as the Forest Officer who shall assist the Forest Settlement Officer in the enquiry ordered in Revenue (Forest) Department Notification No 66, dated the 14th April 1909, regarding the proposed Nyaunggaing Reserve in the Yaméthin District.

This Department Notification No. 23, dated the 18th January 1911, is hereby cancelled.

No. 196.—The Lieutenant-Governor appoints Mr. J. V. Young, Assistant Conservator of Forests, attached to the Pyinmana Forest Division, to succeed the Divisional Forest Officer, Pyinmana Forest Division, as the Forest Officer who shall assist the Forest Settlement Officer in the enquiry ordered in Revenue (Forest) Department Notification No. 260 dated the 12th December 1910, regarding the proposed Yezin Reserve in the Yaméthin District.

No. 197.—This Department Notification No. 21, dated the 18th January 1911, appointing Mr. W. S. Powell, Assistant Conservator of Forests, to succeed the Divisional Forest Officer, Pyinmana, as the Forest Officer who shall assist the Forest Settlement Officer in the enquiry ordered in Revenue (Forest) Department Notification No. 76, dated the 23rd April 1910, regarding the proposed Paunglaung Reserve situated partly in the Toungoo District and partly in the Yaméthin District, is cancelled.

31st October 1911.—No. 39.—Mr. F. H. Todd, Deputy Conservator of Forests, made over and Mr G. F. Matthews, Extra Assistant Conservator of Forests, received charge of the Mandalay Forest Division, on the afternoon of 28th October 1911 and from the same date and hour Mr. F. H. Todd, Deputy Conservator of Forests, availed himself of the leave and furlough granted him in Revenue (Forest Department Notification No 165, dated the 17th October 1911.

1st November 1911.—No. 30.—Leave on medical certificate for one month is granted to Maung San E, Forest Ranger, 1st grade, West Salween Division, in extension of the eleven months' leave on medical certificate granted him in this office Notification No 2, dated 3rd January 1911, No. 7, dated 23rd February 1911, and No 28, dated 2nd September 1911.

7th November 1911.—No 40.—Mr. S. F. Hopwood, Deputy Conservator of Forests, relinquished charge of his timber measuring duty, on the afternoon of 12th October 1911, in the Yaw Forest Division, to which he was posted in Revenue (Forest) Department Notification No 141, dated the 15th August 1911.

8th November 1911.—No. 31.—With reference to Revenue (Forest) Department Notification No 164, dated 17th October 1911, Mr. G. F. R. B. Thurlin, Deputy Conservator of Forests, received charge of the Thaungyin Forest Division from Mr. A. H. M. Barrington, Assistant Conservator of Forests, on the forenoon of 3rd November 1911.

No. 205.—Mr. V. H. T. Fields-Clarke, Assistant Conservator of Forests, attached to the Shwegyin Forest Division, is transferred from Shwegyin and is posted to duty in the Upper Chindwin Forest Division.

No. 206.—Mr. E. A. Sitzler, Assistant Conservator of Forests, attached to the Upper Chindwin Forest Division, is transferred from Kindat and is posted to the charge of the Bampon Forest Sub-division, Southern Shan States Forest Division, in place of Mr. W. A. Robertson, Assistant Conservator of Forests, transferred.

9th November 1911.—No. 208.—On return from leave Mr. F. A. Leete, Deputy Conservator of Forests, is reposted to the charge of the Pyinmana Forest Division in place of Mr. J. V. Young, Assistant Conservator of Forests, who remains attached to the Pyinmana Forest Division.

No. 209. On return from leave Mr. G. R. Jeffery, Deputy Conservator of Forests, is reposted to the charge of Prome Forest Division, in place of Mr. C. B. Smales, Deputy Conservator of Forests, who continues in charge of the Zigôn Forest Division.

No. 210.—On return from leave Mr. G. E. S. Cubitt, Deputy Conservator of Forests, is appointed to be Personal Assistant to the Conservator of Forests, Pegu Circle, in place of Mr. H. B. Anthony, Deputy Conservator of Forests, who remains in charge of the Depôt and Agency Division, Rangoon.

No. 211.—On return from leave Mr. R. E. Marsden, Deputy Conservator of Forests, is appointed to be Director of the Burma Forest School, Pyinmana.

10th November 1911.—No. 212.—On return from leave Mr. T. I. Pocock, Extra Deputy Conservator of Forests, is reposted to the charge of the Myittha Forest Division, in place of Mr. S. E. F. Jenkins, Extra Assistant Conservator of Forests, transferred.

No. 213.—On relief by Mr. T. I. Pocock, Extra Deputy Conservator of Forests, Mr. S. E. F. Jenkins, Extra Assistant Conservator of Forests, in charge of the Myittha Forest Division, is transferred from Mingin and is posted to the charge of the Railway Revenue Range, Toungoo Forest Division.

No. 214.—On relief by Mr. S. E. F. Jenkins, Extra Assistant Conservator of Forests, Mr. B. R. Hutchins, Extra Assistant Conservator of Forests, in charge of the Railway

Revenue Range, Toungoo Forest Division, is transferred from Toungoo and is posted to duty in the Shwegyin Forest Division.

10th November 1911.—No. 31.—With reference to Revenue (Forest) Department Notifications Nos. 190 and 191, dated the 27th October 1911, Mr. C. R. Dun, Deputy Conservator of Forests, made over and Mr. F. Linnell, Deputy Conservator of Forests, received charge of the Pegu Forest Division on the afternoon of the 5th November 1911.

14th November 1911.—No. 41.—With reference to Revenue (Forest) Department Notifications Nos. 171, 172, 173, 175 and 176, dated the 25th October 1911, Mr. E. J. Colston, I.C.S., officiating Deputy Commissioner, assumed charge of his duties as Settlement Forest Officer, in the Minbu and Yaw Forest Divisions on the forenoon of 2nd November 1911.

14th November 1911.—No 32.—With reference to Revenue (Forest) Department Notification No. 205, dated 1st November 1911, Mr. V. H. T. Fields-Clarke, Assistant Conservator of Forests, relinquished charge of his duties in the Shwegyin Forest Division on the afternoon of the 11th November 1911.

No. 33.—With reference to Revenue (Forest) Department Notification No. 202, dated the 31st October 1911, Mr. J. G. F. Marshall, Extra Assistant Conservator of Forests, availed himself of the privilege leave granted him on the 9th October 1911, beforenoon.

TIMBER AND PRODUCE RATES.

C. LEARY AND CO.'S LONDON MARKET REPORT.

1st to 31st October 1911.

EAST INDIA TEAK.—*Timber.*—There is no change in the position; the enquiry is dull and little business has passed; values are firm. *Planks.*—Burma and Siam.—The tone continues dull for ordinary specifications, though prices are fairly maintained; for deck planks and flitches there has been more interest. Java is only occasionally asked for. Quotations are: Timber, £14 to £25 (Java £9 to £17); Flitches, £16 to £22 (Hewn Java £10 to £16); Planks, £13 10*s.* to £25 (Java £12 to £16); all per load on c.i.f. terms. The arrivals of Timber were 85 loads from Burma, and 20 loads from Java. The analysis of deliveries and stocks is as follows:—

	Deliveries for October. Loads.		Deliveries to 31st October. Loads.		Dock Stock. Loads.	
	Timber.	*Planks.*	*Timber.*	*Planks.*	*Timber.*	*Planks.*
1911 ...	277	226	2,329	2,838	4,359	3,553
1910 ...	48	339	2,562	2,963	1,940	3,190
1909 ...	242	278	2,865	2,180	2,809	3,342

PADOUK.—There is only a limited demand.

PENCIL CEDAR.—Only large and clean logs are required, worth from 3*s.* upwards per foot cube, calliper measure.

SATINWOOD.—East India.—Business is restricted owing to the high prices required by shippers; stocks are considerable, and the demand is quiet. Quotations in parcel are: 6*d.* to 1*s.* 6*d.* for East India.

ROSEWOOD.—East India.—Stocks are by no means heavy, and there is a favourable outlet for imports of good character; we quote £7 to £15 per ton.

EBONY.—Ceylon.—Large, prime logs can be advised. East India.—Parcels of good dimensions and quality would obtain satisfactory prices. Quotations are: Ceylon £7 to £15 per ton, East India £6 to £12.

MARKET RATES FOR FOREST PRODUCTS.

Name of Product.	Quotations, English or Indian.	Rates for Oct. 1911.	Rates for Novr. 1911.
Cardamoms ...	English, per lb.	1*s.* 11*d.* to 3*s.* 2*d.*	1*s.* 11*d.* to 3*s.* 7*d.*
Croton Seeds ...	,, per cwt.	47*s.* 6*d.* to 55*s.*	70*s.* to 75*s.*
Cutch ...	,, ,,	30*s.* to 35*s.*	25*s.* to 32*s.* 6*d.*
,, ...	Indian ,,	(Not quoted.)	(Not quoted.)
Gum Arabic—			
Karachi ...	English, per cwt.	20*s.* to 30*s.*	30*s.* to 40*s.*
Madras ...	,, ,,	15*s.* to 25*s.*	30*s.* to 40*s.*
Gum, Kino ...	,, per lb.	9*d.* to 1*s.*	9*d.* to 1*s.*
Myrabolans—			
Bengal ...	English, per cwt.	4*s.* to 5*s.* 6*d.*	3*s.* 9*d.* to 4*s.* 3*d.*
Bombay ...	,, ,,	4*s.* 6*d.* to 6*s.* 3*d.*	4*s.* 6*d.* to 6*s.* 6*d.*
Madras ...	,, ,,	4*s.* 6*d.* to 5*s.*	4*s.* 6*d.* to 5*s.*
Myrabolans ...	Indian, per B. Md.	Rs. 2-8.	Rs. 2-6 to Rs. 2-8.
Nux Vomica—			
Bengal ...	English, per cwt.	7*s.* to 7*s.* 6*d.*	7*s.* 6*d.* to 8*s.* 6*d.*
Madras ...	,, ,,	7*s.* to 8*s.* 6*d.*	8*s.* to 9*s.*
Cochin ...	,, ,,	8*s.* 6*d.* to 9*s.* 6*d.*	9*s.* 6*d.* to 11*s.*
Oil, Lemon Grass ...	,, per oz.	5*d.*	(Not quoted.)
,, Rosha Grass ...	Indian, per seer	Rs. 13-4 to Rs. 13 8.	Rs 11-8 to Rs. 13-2.
,, Sandalwood ...	English, per lb.	10*s.* 9*d.* to 11*s.*	10*s.* 4*d.* to 11*s.*
Rosin ...	,, per cwt.	15*s.* 3*d.* to 15*s.* 9*d.*	15*s.* 3*d.* to 15*s.* 7½*d.*
,, ...	Indian ,,	Rs. 16-8 to Rs. 17.	Rs. 16-8 to Rs. 17.
Turpentine ...	English ,, ...	38*s.* 9*d.* to 39*s.* 9*d.*	30*s.* to 38*s.* 6*d.*
Rubber, India—			
Assam ...	Indian, per B. Md.	Rs. 50 to Rs. 145.	Rs. 40 to Rs. 140.
,, ...	English, per lb.	3*s.* 6*d.*	4*s.*
Burma ...	,, ,,	2*s.* to 3*s.*	1*s.* 9*d.* to 3*s.* 8*d.*
Rubber, Para ...	,, ,,	3*s.* 11½*d.* to 4*s.* 7¼*d.*	3*s.* 10¾*d.* to 4*s.* 4¼*d.*
Seed-lac ...	,, per cwt.	52*s.* 6*d.* to 72*s.* 6*d.*	52*s.* 6*d.* to 72*s.* 6*d.*
Shellac, T. N. Diamond	Indian, per B. Md.	Rs. 31-8 to Rs. 32.	Rs. 31-8 to Rs. 32.
,, T. N. Orange	English, per cwt.	65*s.* to 66*s.*	64*s.* to 66*s.*
Tamarinds—			
Calcutta ...	,, ,,	10*s.* to 12*s.*	10*s.* to 12*s.*
Madras ...	,, ,,	4*s.* to 5*s.*	4*s.* to 5*s.*
Teak (Selected Indian, 1st class).	Indian, per ton of 50 c.ft.	Rs. 115 to Rs. 135.	Rs. 115 to Rs. 135.

Note.—(1) B. Md. indicates Bengal Maund, which is equal to 80 lbs.

(2) T. N. in Diamond and T. N. Orange are commercial terms applied to certain grades of shellac.

LIST OF BOOKS AND PUBLICATIONS RECEIVED BY THE HONORARY EDITOR DURING NOVEMBER 1911.

India Rubber World for October and November 1911.

New and Noteworthy Hawaiian Plants by Dr. L. Radlkoffer and J. F. Rock.

Eucalyptus Culture in Hawaii by Louis Margolin.

Indian Law Reports, August 1911, Madras Series.

Indian Engineering for October 28th and November 4th, 11th, 18th and 25th.

Tropical Agriculturist for October 1911.

Progress Report on Forest Administration in N.-W. Frontier Provinces for the year 1910-11.

Indian Field for November 2nd, 9th, 16th and 23rd.

Agricultural Bulletin of the Straits and Federated Malay States for October 1911 (two copies).

The Indian Trade Journal for November 2nd, 9th, 16th and 23rd.

Agricultural Journal of India, Vol. VI, Pt. IV, for October 1911.

The Transactions of the Linnean Society of London. On the Life-History of *Chermes Himalayensis*, Steb., on the Spruce (Picea Morinda) and Silver Fir (Abies Webbiana) by E. P. Stebbing.

Revue des Eaux et Forêts, Nos. 20 and 21 for October and November 1911 respectively.

Experiment Station Record, United States Department of Agriculture, Vol. XXV, Nos. 4, 5, and 6.

American Forestry for October 1911.

Note on the Prospects of Establishing Match Factories in Southern India (100 copies).

Forestry Quarterly, Vol. IX, No. 3, for September 1911.

Progress Report of the Forest Research Institute for 1910-11.

Land Records Administration Report of Burma for the year ending 30th June 1911.

The Indian Forest Memoirs, Vol. I, Pt. 1. On some Indian Forest Grasses and their Oecology by R. S. Hole.

The Botanical Gazette for October 1911.

The Indian and Eastern Engineer for November 1911.

The Reviews on the Departmental Administration Reports for 1086 M. E., Cochin State, for 1910-11.

The Forest Flora of New South Wales, Vol. V, Pts. 4 and 5 (two copies of each).

Description of the Working Sugar Factory exhibited in the Agricultural Court, United Provinces Exhibition, by Messrs. Blair, Campbell and McLean. Bulletin No. 26.

"Proceedings of the Imperial Forest Institute," St. Petersburg, Pt. XXI, 1911.

Inspector-General of Forests' Review of Forest Administration in British India for the year 1909-10.

Lower Burma Rulings, Vol. VI, Pt. III.

Report of the Agricultural Department, Bengal, for the year ending 30th June 1911.

Fauna of British India, Fresh-water Sponges, Hydroids and Polyzoa by N. Annandale, D.Sc.

Monthly Weather Review for July 1911.

Printed at the Pioneer Press, by GEO. SIM, No. 2014—15-1-12.

GAZETTE NOTIFICATIONS.

1.—Gazette of India.

28*th November* 1911.—No. 1137-*F.*—216—12.—Mr. W. F. L. Tottenham, Deputy Conservator of Forests, Burma, relieved Mr. E. S. Carr of the charge of the Southern Circle, Burma, with effect from the afternoon of the 28th October 1911, from which date he is appointed to officiate as Conservator of Forests, 3rd grade.

Mr. E. S. Carr, Conservator, on relief was posted to the charge of Tenasserim Circle, Burma, where he relieved Mr. J. Copeland on the afternoon of the 1st November 1911.

Mr. J. Copeland, Conservator, on transfer from Burma, assumed charge of the office of Conservator of Forests, Punjab and North-West Frontier Province, with effect from the afternoon of the 14th November 1911, the date from which Mr. C. P. Fisher, Conservator of Forests, proceeded on combined leave for 2 years, granted him by the Punjab Government.

13*th December* 1911.—No. 1180-*F.*-131-17.—On return from combined leave, Mr. M. Hill, Conservator, 2nd grade, assumed charge of the Office of Conservator of Forests, Northern Circle, Central Provinces, with effect from the afternoon of 30th November 1911, the date on which he relieved Mr. H. H. Forteath, Officiating Conservator of Forests, 3rd grade.

From the same date the following reversions take place :—

Mr. H. H. Haines, Conservator, 3rd (officiating 2nd) grade, Central Provinces, reverts to his substantive appointment in the 3rd grade.

Mr. H. H. Forteath, Officiating Conservator, 3rd grade, Central Provinces, reverts to his substantive appointment in the class of Deputy Conservators in Burma.

20*th December* 1911.—No. 15-*F.*—On return from combined leave, Mr. R. S. Pearson, Deputy Conservator of Forests, Bombay Presidency, resumed charge of the office of Forest Economist at the Forest Research Institute and College, Dehra Dun, with effect from the afternoon of 28th November 1911, the date on which he relieved Mr. A. Rodger, Instructor at the College, of the additional charge of that post.

2.—Madras Gazette.

22*nd November* 1911.—No. 527.—The following promotion and reversion of Forest Officers are ordered with effect from the date of return to duty of Mr. A. W. Lushington :—

(1) Mr. Alfred Wyndham Lushington, Conservator of Forests, 2nd grade, *to act* as Conservator of Forests, 1st grade, *vice* Mr. C. E. Brasier, on leave.

(2) Mr. Frank Adrian Lodge, Conservator of Forests, 1st grade, acting, *to be* Conservator of Forests, 2nd grade.

30*th November* 1911.—*Leave.*—Under article 260 of the Civil Service Regulations, the Board grants to M. R. Ry. V. Raman Menon Avargal, Extra Assistant Conservator of Forests, and Forest Assistant, Board of Revenue, privilege leave for twenty-two days from the 2nd December 1911 with permission to affix the Christmas and New Year's holidays to the leave.

9*th December* 1911.—No. 544.—Mr. T. N. Hearsey, Extra Assistant Conservator of Forests, is granted privilege leave for two months with effect from the 2nd January 1912.

3.—Bombay Gazette.

28*th November* 1911.—No. 11245.—Mr. A. G. Edie, Deputy Conservator of Forests and Divisional Forest Officer, Eastern Division, Kanara, has been appointed to hold charge of the current duties of the Divisional Forest Officer, Southern Division, Kanara, in addition to his own, with effect from 24th April 1911.

30*th November* 1911.—No. 3414.—Messrs. D. N. Damle, Extra Assistant Conservator of Forests, and L. Napier, Deputy Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, East Khandesh, on the forenoon of 13th November 1911.

No. 5289.—Mr. A. G. Edie, Deputy Conservator of Forests, delivered over and Mr. G. S. Butterworth, Assistant Conservator of Forests, received charge of the Kanara Southern Division on the forenoon of 24th November 1911.

10*th December* 1911.—No. 5368.—Messrs. W. E. Copleston and E. M. Hodgson, Deputy Conservators of Forests, respectively delivered over and received charge of the Belgaum Forest Division on the forenoon of the 27th November 1911.

19*th December* 1911.—No. 2704.—Mr. W. C. Milne, Assistant Conservator of Forests, reported himself for duty on the forenoon of 15th December 1911, as per Government Resolution No. 11416 of 1st December 1911.

21*st December* 1911.—No. 3545.—Mr. H. W. Starte, Assistant Conservator of Forests, who has been posted to the Central Circle (*vide* Government Resolution No. 11416, dated 1st December 1911), reported himself for duty on the forenoon of 1st December 1911 and was attached temporarily to the Poona Division.

27*th December* 1911.—No. 12028.—Mr. Lakshman Shamrao Koppikar, Extra Assistant Conservator of Forests, is allowed an extension by six months of the furlough granted to him in Government Notification No. 10901, dated 30th November 1910.

4.—Bengal Gazette.

21*st November* 1911.—No. 17.—Mr. E. R. Comber, Extra Assistant Conservator of Forests, on his return from privilege leave, is reposted to the charge of the Sambalpur Forest Division.

21*st November* 1911.—No. 18.—Mr. A. P. Mudaliar, Extra Assistant Conservator of Forests, on relief by Mr. E. R. Comber, Extra Assistant Conservator of Forests, is transferred to Singhbhum Forest Division as an attached officer.

19*th December* 1911.—No. 19-*F.*—Mr. G. M. Cooper, Assistant Conservator of Forests, on first appointment, is posted as an attached officer to the Singhbhum Forest Division, with head-quarters at Chaibassa.

5.—Eastern Bengal and Assam Gazette.

25*th November* 1911.—No. 5963-*F.*—Mr. Gurudas Chatarji, Extra Assistant Conservator of Forests, on return to duty, is attached to the Lakhimpur Forest Division.

27*th November* 1911.—No 5976-*F.*—Mr. J. Homfray, Assistant Conservator of Forests, in charge of the Chittagong Forest Division, temporarily held charge of the Chittagong Hill Tracts Forest Division in addition to his own duties, with effect from the 20th October 1911, until he was relieved by Mr. Cooper.

20*th December* 1911.—No. 6347-*F.*—Mr. A. J. W. Milroy, Assistant Conservator of Forests, was appointed to hold charge of the Jalpaiguri Forest Division, from the 1st to the 8th November 1911, both days inclusive.

6.—United Provinces Gazette.

Postings.

27*th November* 1911.—No. 7.—On his return from deputation to Kashmir State, Mr. R. C. Milward, Deputy Conservator of Forests, to the charge of the Chakrata Forest Division of the Western Circle.

4*th December* 1911.—No. 13.—Babu Sirtaj Bahadur, Officiating Extra Assistant Conservator of Forests, held charge of the Banda Range in the Bundelkhand Forest Division of the Eastern Circle, from 2nd March 1911 to 25th April 1911.

Transfers.

27*th November* 1911.—No. 8.—Mr. J. Whitehead, Deputy Conservator of Forests, from Chakrata Forest Division of the Western Circle to Gorakhpur Forest Division of the Eastern Circle.

No. 9. On relief by Mr. J. Whitehead, Deputy Conservator of Forests, Lala Gulab Rai, Extra Assistant Conservator of Forests, from Gorakhpur Forest Division to Pilibhit Forest Division of the Eastern Circle.

No. 10.—On relief by Lala Gulab Rai, Extra Assistant Conservator of Forests, Mr. G. O. Coombs, Extra Assistant Conservator of Forests, from Pilibhit Forest Division to Bundelkhand Forest Division of the Eastern Circle.

No. 11.—On relief by Mr. G. O. Coombs, Extra Assistant Conservator of Forests, Mr. H. B. Gawke, Extra Assistant Conservator of Forests, from Bundelkhand Forest Division to Kheri Forest Division of the Eastern Circle, as an attached officer.

4th December 1911.—No. 12.—In supersession of Notification No. 5, dated the 14th October 1911, Babu Ram Swarup, Extra Assistant Conservator of Forests, attached to the Naini Tal Forest Division of the Western Circle, to the Ramnagar Forest Division of the same Circle, as attached officer.

8th December 1911.—No. 14.—Mr. E. L. Haslett Extra Assistant Conservator of Forests, from Siwalik Forest Division to Ramnagar Forest Division of the Western Circle as an attached officer, with effect from the 15th December 1911 or subsequent date.

11th December 1911.—No. 16.—Saiyid Mahdi Hassan, Extra Assistant Conservator of Forests, attached to the Direction Forest Division of the Western Circle, on return from leave, to the Gonda Forest Division of the Eastern Circle.

No. 17.—Mr. H. C. Ross, Extra Assistant Conservator of Forests, on being relieved by Saiyid Mahdi Hassan, Extra Assistant Conservator of Forests, to the Haldwani Forest Division of the Eastern Circle, as attached officer (working-plans).

Leave.

9th December 1911.—No. 15.—Saiyid Mahdi Hasan, Extra Assistant Conservator of Forests, privillege leave on medical certificate, for six weeks, in extension of the leave granted him in Notification No. 1, dated the 13th October 1911.

7.—Punjab Gazette.

28th Novomber 1911.—No. 1137-*F.*—216—12.—Mr. W. F. L. Tottenham, Deputy Conservator of Forests, Burma, relieved Mr. E. S. Carr of the charge of the Southern Circle, Burma, with effect from the afternoon of the 28th October 1911, from which date he is appointed to officiate as Conservator of Forests, 3rd grade.

Mr. E. S. Carr, Conservator, on relief was posted to the charge of Tenasserim Circle, Burma, where he relieved Mr. J. Copeland on the afternoon of the 1st November 1911

Mr. J. Copeland, Conservator, on transfer from Burma, assumed charge of the office of Conservator of Forests, Punjab and North-West Frontier Province, with effect from the afternoon of the 14th November 1911, the date from which Mr. C. P. Fisher, Conservator of Forests, proceeded on combined leave for two years, granted him by the Punjab Government.

29th November 1911.—No 608.—Leave.—Lala Daulat Ram, Extra Deputy Conservator of Forests, is granted 6 months' furlough on medical certificate in continuation of 18 months' combined leave granted him in Punjab Government Notification No. 157-Forests, dated the 27th March 1910.

13th December 1911.—No. 626.—Leave.—Lala Sundar Das, Extra Assistant Conservator of Forests, is granted six weeks' privilege leave with effect from the afternoon of the 12th October 1911.

16th December 1911.—No. 631.—Notification.—On return from privilege leave granted him in Punjab Government Notification No. 368 Forests, dated the 24th July 1911, Munshi Imam-ud-din, Extra Assistant Conservator of Forests, reported himself for duty on the afternoon of the 30th September 1911, and was attached to the Kangra Forest Division. He took over charge of the Kangra Forest Division on the afternoon of the 3rd October 1911, relieving Lala Daulat Ram, Extra Assistant Conservator of Forests, who was transferred to the Multan Forest Division.

23rd December 1911.—No. 644.—Notification.—Mr. C. G. Trevor, Deputy Conservator of Forests, on return from the combined leave granted him in Notification No. 171, dated the 4th April 1911, landed at Bombay on the afternoon of the 21st November 1911, and took over charge of his duties as an attached officer to the Bashahr Division on the afternoon of the 23rd idem at Simla.

8.—Central Provinces Gazette.

31*st October* 1911.—No. 11.—The following postings are ordered among Extra Assistant Conservators of Forests :—

(1) On return from leave, Mr. Narsingh Rao is attached to the Yeotmal Division.

(2) On relief by Mr. M. Narsingh Rao, Mr. Pandurang Narayan is transferred to the Nimar Division as an attached officer.

(3) On relief by Mr. Pandurang Narayan, Mr. V. C. Bhagwat is transferred to the Melghat Division as an attached officer.

19*th November* 1911.—No. 24.—The following transfers are ordered among the Extra Assistant Conservators not in charge of Divisions :—

(1) Mr. Faiz Bakhsh, Extra Assistant Conservator of Forests, from the Bilaspur Division to the Direction Division of the Southern Circle, with effect from the 1st December 1911.

(2) Mr. C. V. Sarwate, Extra Assistant Conservator of Forests, from the Jubbulpore Division to the Chhindwara Division, with effect from the 1st January 1912.

25*th November* 1911.—No. 25 —On return from foreign service in Mysore, Mr. Inamati Sham Rao, Extra Assistant Conservator of Forests, is attached to the Akola Forest Division of the Berar Circle.

5*th December* 1911.—No. 2219.—Mr. C. M. Barlow, Assistant Conservator of Forests, who has been appointed by His Majesty's Secretary of State for India, to the Imperial Forest Service, is posted to the Saugor Forest Division of the Northern Circle, Central Provinces.

13*th December* 1911 —No. 27.—Under Article 260 of the Civil Service Regulations, privilege leave for ten days is granted to Mr. Dhanjishah N. Avasia, Extra Assistant Conservator of Forests, and Instructor, Vernacular Forest School, Balaghat, with effect from the 14th December 1911.

9.—Burma Gazette.

15*th November* 1911.—No. 31.—Mr. S. F. Hopwood, Deputy Conservator of Forests, assumed charge of the Working Plans duty in the Lower Chindwin Division on the forenoon of 16th October 1911.

No. 42.—Messrs. W. A Robertson, Assistant Conservator of Forests, made over and A. E. Ross, Deputy Conservator of Forests, received charge, of the Southern Shan States Forest Division on the forenoon of 8th November 1911.

20*th November* 1911.—No. 32.—With reference to Revenue (Forest) Department Notification No. 212, dated 10th November 1911, Mr. S. E. F. Jenkins, Extra Assistant Conservator of Forests, made over and Mr. T. I. Pocock, Extra Deputy Conservator of Forests, received charge of the Myittha Forest Division on the forenoon of 13th November 1911.

No. 34.—With reference to Revenue (Forest) Department Notification No. 168, dated 20th October 1911, Mr. F. A. Reich, Extra Assistant Conservator of Forests, assumed charge of his duties in the West Salween Forest Division on the 10th November 1911, before noon.

No. 35.—With reference to Revenue (Forest) Department Notification No. 166, dated 20th October 1911, Mr. R. L. Pocock, Extra Deputy Conservator of Forests, received charge of the South Tenasserim Forest Division from Mr. C. G. E. Dawkins, Assistant Conservator of Forests, on the forenoon of the 11th November 1911.

No. 215.—On return from leave Mr. J. G. F. Marshall, Extra Assistant Conservator of Forests, is reposted to duty in the Toungoo Forest Division.

No. 216.—On return from leave Mr. D. A. Allan, Extra Assistant Conservator of Forests, is reposted to duty in the Thayetmyo Forest Division.

No. 217.—Mr. T. W. Forster, Extra Deputy Conservator of Forests, attached to the Thayetmyo Forest Division, is transferred from Thayetmyo and is posted to duty in the Tharrawaddy Forest Division.

23*rd November* 1911.—No. 218.—On the conclusion of the special duty to which he was posted in this Department Notification No. 141, dated the 15th August 1911, Mr. S. F. Hopwood, Deputy Conservator of Forests, was transferred from Pakokku and was posted to Working Plans duty in the Lower Chindwin Forest Division with effect from the 16th October 1911.

No. 219.—On return from leave Mr. W. S. Powell, Assistant Conservator of Forests, is posted to girdling duty in the Yaw Forest Division.

24th November 1911.—No. 43.—With reference to Revenue (Forest) Department Notification No. 167, dated the 20th October 1911, Mr. C. G. E. Dawkins, Assistant Conservator of Forests, received charge of the Gangaw Forest Subdivision, Yaw Forest Division, on the forenoon of the 22nd November 1911.

No. 44.—With reference to Revenue (Forest) Department Notification No. 194, dated the 30th October 1911, Messrs. W. A. Robertson, Assistant Conservator of Forests, made over and A. E. Ross, Deputy Conservator of Forests, received charge of the Bampon Forest Subdivision, Southern Shan States Forest Division, on the afternoon of the 23rd November 1911.

25th November 1911.—No. 220.—In this Department Notification No. 190, dated the 27th October 1911, *for* "one month and twenty-four days" read "one month and twenty-five days".

27th November 1911.—No. 45.—With reference to Revenue (Forest) Department Notification No. 211, dated the 9th November 1911, Mr. R. E. Marsden, Deputy Conservator of Forests, received charge of the Directorship of the Pyinmana Forest School from Mr. F. A. Leete, Deputy Conservator of Forests, on the forenoon of 23rd November 1911.

27th November 1911.—No. 221.—On the conclusion of the special duty to which he was posted in this Department Notification No. 138, dated the 15th August 1911, Mr. W. Lawton, Assistant Conservator of Forests, is transferred from Mandalay and is reposted to duty in the Prome Forest Division.

No. 222.—On the conclusion of the special duty to which he was posted in this Department Notification No. 140, dated the 15th August 1911, Mr. J. W. Bradley, Assistant Conservator of Forests, is transferred from Mandalay and is reposted to duty in the Katha Forest Division.

No. 223.—Mr. F. P. Thompson, Probationary Extra Assistant Conservator of Forests, attached to the Kado and Agency Forest Division, is transferred from Moulmein and is posted to duty in the Shwegyin Forest Division.

No. 224.—Mr. A. J. Butterwick, Probationary Extra Assistant Conservator of Forests, attached to the Thayetmyo Forest Division, is transferred from Thayetmyo and is posted to duty in the Pegu Forest Division.

No. 225.—Mr. R. C. V. Palmer, Extra Assistant Conservator of Forests, attached to the Prome Forest Division, is transferred from Prome and is posted to duty in the Zigon Forest Division.

No. 226.—Mr. E. V. Ellis, Deputy Conservator of Forests, attached to the Zigon Forest Division, is posted to Working Plans duty in the Tharrawaddy Forest Division.

No. 227.—Mr. W. H. Miller, Extra Assistant Conservator of Forests, on probation, is confirmed in his appointment with effect from the 21st July 1911.

28th November 1911.—No. 36.—With reference to Revenue (Forest) Department Notification No. 213, dated the 10th November 1911, Mr. S. E. F. Jenkins, Extra Assistant Conservator of Forests, took over charge of the Railway Revenue Range, Toungoo Forest Division, from Mr. B. R. Hutchins, Extra Assistant Conservator of Forests, on the 24th November 1911, afternoon.

1st December 1911.—No. 35.—With reference to this office Notification No. 32, dated the 20th November 1911, Maung Po Thin (2), Forest Ranger, 3rd grade, assumed charge of the Podaw Range, in the Bassein-Myaungmya Forest Division, on the forenoon of the 12th November 1911.

No. 37.—With reference to Revenue (Forest) Department Notification No. 215, dated the 20th November 1911, Mr. J. G. F. Marshall, Extra Assistant Conservator of Forests, returned from privilege leave and resumed charge of his duties in the Toungoo Forest Division on the 17th November 1911, beforenoon.

2nd December 1911.—No. 38.—With reference to Revenue (Forest) Department Notification No. 214, dated the 10th November 1911, Mr. B. R. Hutchins, Extra Assistant Conservator of Forests, assumed charge of his duties in the Shwegyin Forest Division on the 25th November 1911, afternoon.

2nd December 1911.—No. 46.—With reference to Revenue (Forest) Department Notification No. 194, dated the 30th October 1911, Messrs. G. F. Matthews, Extra Assistant Conservator of Forests, made over and W. A. Robertson, Assistant Conservator of Forests, received charge of the Mandalay Forest Division on the forenoon of 2nd December 1911.

5th December 1911.—No. 239.—On return from leave Mr. D. P. Hewett, Assistant Conservator of Forests, is reposted to the charge of the Thaungyin Forest Division in place of Mr. G. F. R. Blackwell Thurling, Deputy Conservator of Forests, who continues in charge of the Ataran Forest Division.

No. 33.—With reference to Revenue (Forest) Department Notification No. 205, dated 1st November 1911, Mr. V. H. T. Fields-Clarke, Assistant Conservator of Forests, assumed charge of his duties in the Upper Chindwin Division on the afternoon of 20th November 1911.

No. 34.—With reference to Revenue (Forest) Department Notification No. 206, dated 1st November 1911, Mr. E. A. Sitzler, Assistant Conservator of Forests, relinquished charge of his duties in the Upper Chindwin Division on the forenoon of 22nd November 1911.

6th December 1911.—No. 240.—On the conclusion of the special duty to which he was posted in this Department Notification No. 136, dated the 15th August 1911, Mr. A. P. Davis, Assistant Conservator of Forests, is transferred from Pakokku and is posted to duty in the Pyinmana Forest Division.

No. 241.—On the conclusion of the special duty to which he was posted in this Department Notification No. 137, dated the 15th August 1911, Mr. C. Gwyer, Assistant Conservator of Forests, is transferred from Pakokku and is reposted to duty in the Thayetmyo Forest Division.

No. 242.—On the conclusion of the special duty to which he was posted in this Department Notification No. 155, dated the 20th September 1911, Mr. G. H A. Goldberg, Assistant Conservator of Forests, is transferred from Pakokku and is reposted to duty in the Tharrawaddy Forest Division.

9th December 1911.—No. 37.—With reference to Revenue (Forest) Department Notification No. 224, dated 27th November 1911, Mr A J. Butterwick. Probationary Extra Assistant Conservator of Forests, relinquished charge of his duties in the Thayetmyo Forest Division, on the afternoon of the 4th November 1911 and assumed charge of his duties in the Pegu Forest Division on the forenoon of 13th November 1911.

11th December 1911.—No. 38.—With reference to Revenue (Forest) Department Notification No. 216, dated 20th November 1911, Mr. D A. Allan, Extra Assistant Conservator of Forests, asssumed charge of his duties in the Thayetmyo Forest Division, on the forenoon of the 30th November 1911.

No. 39.—With reference to Revenue (Forest) Department Notification No. 217, dated 20th November 1911, Mr. T. W. Forster, Extra Deputy Conservator of Forests, relinquished charge of his duties in the Thayetmyo Forest Division, on the forenoon of the 30th November 1911, and assumed charge of his duties in the Tharrawaddy Forest Division on the forenoon of the 4th December 1911.

13th December 1911.—No. 39.—With reference to Revenue (Forest Department Notification No. 223, dated the 27th November 1911, Mr. F. P. Thomson, Probationary Extra Assistant Conservator of Forests, relinquished charge of his duties in the Kado and Agency Forest Division on the afternoon of the 29th November 1911, and assumed charge of his duties in the Shwegyin Forest Division on the forenoon of the 4th December 1911.

14th December 1911.—No. 243.—Under the provisions of Article 260 of the Civil Service Regulations, privilege leave for seven weeks is granted to Mr. H. H. Forteath, Deputy Conservator of Forests, with effect from the date on which he was relieved of the charge of the office of Conservator of Forests, Northern Circle, Central Provinces, from which date he was reverted to the Burma Forest Service.

No. 47.— With reference to Revenue (Forest) Department Notification No. 219, dated the 23rd November 1911, Mr. W. S. Powell, Assistant Conservator Forests, assumed charge of his girdling duty in the Yaw Forest Division on the afternoon of 8th December 1911.

15th December 1911.—No. 48.—With reference to Revenue (Forest) Department Notification No. 206, dated the 1st November 1911, Messrs. A. E. Ross, Deputy Conservator of Forests, made over and E. A. Sitzler, Assistant Conservator of Forests, received charge of the Bampon Forest Subdivision, Southern Shan States Forest Division, on the afternoon of 13th December 1911.

No. 35.—With reference to Revenue (Forest) Department Notification No. 221, dated the 27th November 1911, Mr. W. Lawton, Assistant Coservator of Forests, relinquished charge of his duties in the Mandalay Depôt Division on the forenoon of the 8th December 1911.

No. 36.—With reference to Revenue (Forest) Department Notification No. 222, dated the 27th November 1911, Mr. J. W. Bradley, Assistant Conservator of Forests, relinquished charge of his duties in the Mandalay Depôt Division on the afternoon of 9th December 1911.

No. 244.—Mr. J. M. D. Mackenzie, who has been appointed by His Majesty's Secretary of State for India to the Imperial Forest Department as Assistant Conservator of Forests, is posted on arrival, to the headquarters of the Upper Chindwin Forest Division of the Northern Circle.

No. 245.—Mr. A. W. Moodie, who has been appointed by His Majesty's Secretary of State for India to the Imperial Forest Department as Assistant Conservator of Forests, is posted, on arrival, to the headquarters of the Tharrawaddy Forest Division of the Pegu Circle.

No. 246.—Mr. R. Unwin, who has been appointed by His Majesty's Secretary of State for India to the Imperial Forest Department as Assistant Conservator of Forests, is posted, on arrival, to the headquarters of the Pyinmana Forest Division of the Southern Circle.

No. 247.—Mr. G. C. Cheyne, who has been appointed by His Majesty's Secretary of State for India to the Imperial Forest Department as Assistant Conservator of Forests, is posted, on arrival, to the headquarters of the Ruby Mines Forest Division of the Southern Circle.

No. 248.—Mr. C. K. Hargreaves, who has been appointed by His Majesty's Secretary of State for India to the Imperial Forest Department as Assistant Conservator of Forests, is posted, on arrival, to the headquarters of the Toungoo Forest Division of the Tenasserim Circle.

20th December 1911.—No. 251.—With reference to this Department Notification No. 245, dated the 15th December 1911, Mr. A. W. Moodie, Assistant Conservator of Forests, reported his arrival in Rangoon on the 16th December 1911, afternoon.

No. 252.—With reference to this Department Notification No. 246, dated the 15th December 1911, Mr. R. Unwin, Assistant Conservator of Forests, reported his arrival in Rangoon on the 16th December 1911, afternoon.

No. 253.—With reference to this Department Notification No. 247, dated the 15th December 1911, Mr. G. C. Cheyne, Assistant Conservator of Forests, reported his arrival in Rangoon on the 16th December 1911, afternoon

No. 254.—With reference to this Department Notification No. 248, dated the 15th December 1911, Mr. C. K. Hargreaves, Assistant Conservator of Forests, reported his arrival in Rangoon on the 16th December 1911, afternoon.

21st December 1911.—No. 255.—Mr. W. S. Powell, Assistant Conservator of Forests, has been granted by His Majesty's Secretary of State for India an extension of extraordinary leave without pay for three days in continuation of the combined leave granted to him in this Department Notification No. 88, dated the 8th May 1911.

TIMBER AND PRODUCE RATES.

C. LEARY AND CO.'S LONDON MARKET REPORT.

1st to 30th November 1911.

EAST INDIA TEAK.—*Timber.*—Burma and Siam.—Sales made during the past month have been limited, but there are some fair-sized enquiries to be quoted on shortly and the tone for first-class timber is slightly firmer ; second class, however, remains dull in tone, as does Java. *Planks.*—There has been slightly more enquiry for the older descriptions, but buyers can only be induced to operate at favourable rates and the somewhat higher prices now quoted have at once had a deterrent effect. Java is seldom enquired for. The arrivals of Timber were 250 loads from Burma. Quotations are:

Timber, £14 to £25 (Java £9 to £17); Flitches, £16 to £22 (Hewn Java £10 to £16); Planks, £13 10*s.* to £25 (Java £12 to £16); all per load on c.i.f. terms.

	Deliveries for November. Loads.		Deliveries to 30th November. Loads.		Dock Stock. Loads.	
	Timber.	*Planks.*	*Timber.*	*Planks.*	*Timber.*	*Planks.*
1911 ...	89	194	2,418	3,032	4,583	3,722
1910 ...	408	382	2,970	3,345	1,739	2,991
1909 ...	393	313	3,258	2,493	2,566	3,172

PADOUK.—Shipments cannot be encouraged.

PENCIL CEDAR.—The demand is restricted to prime, large timber worth about 3*s.* upwards per foot cube, calliper measure.

SATINWOOD.—East India.—The tone is extremely dull, business being of a hand-to-mouth character. Quotations in parcel are: 6*d.* to 1*s.* 6*d.* for East India.

ROSEWOOD.—East India.—There is a fair enquiry and shipments of both prime and medium quality can be recommended; we quote £7 to £15 per ton.

EBONY.—Ceylon.—Limited parcels of large logs of good character would obtain fair rates. East India—Shipments of strictly prime wood might be made to advantage. Quotations are: Ceylon £7 to £15 per ton, East India £6 to £12.

DENNY, MOTT & DICKSON, LIMITED.

WOOD MARKET REPORT.

London, 1st December 1911.

TEAK.—The landings in the docks in London during November consisted of 313 loads of logs and 363 loads of planks and scantlings, or a total of 676 loads, as against 390 loads for the corresponding month of last year. The deliveries into consumption were 89 loads of logs and 194 loads of planks and scantlings—together 283 loads, against 790 loads for November, 1910.

The dock stocks at date analyse as follows:—

LOGS ...	Burmah & Siam, 3,767 loads, as against 1,255 loads at the same date last year.								
	Java ... 816	,,	,,	484	,,	,,	,,	,,
PLANKS AND	Burmah & Siam 3,040	,,	,,	2,515	,,	,,	,,	,,
CONVERSIONS	Java ... 682	,,	,,	476	,,	,,	,,	,,
Total	... 8,305	,,	,,	4,730	,,	,,	,,	,,

The import of logs during November, although very modest, nevertheless exceeded the rate of the current demand which continues to be of an insignificant character. Whilst the high cost of first-class logs is a very sufficient reason for consumers substituting other material for Teak wherever possible, the cost of planks is still fairly reasonable as compared with the cost of former years, and the falling off in consumption tends to point to dulness in the Rolling-stock industry, which however may pass away if the present promise of the subsidence of the labour unrest in the Railway world is realized. The advices from both Burmah and Siam continue to be quite consistent as to the scarcity of first-class Teak logs; and the nature of the demand both in the United Kingdom and on the Continent, makes the importation of inferior Teak altogether inadvisable, for the reason that where teak is a necessity in constructional work, first-class quality is essential.

MARKET RATES FOR FOREST PRODUCTS.

Name of Product.	Quotations, English or Indian.	Rates for Nov. 1911.	Rates for Decr. 1911.
Cardamoms ...	English, per lb.	1*s.* 11*d.* to 3*s.* 7*d.*	2*s.* 1*d.* to 3*s.* 8*d.*
Croton Seeds ...	,, per cwt.	70*s.* to 75*s.*	70*s.* to 75*s.*
Cutch ...	,, ,,	25*s.* to 32*s.* 6*d.*	27*s.* 6*d.* to 36*s.* 6*d.*
,, ...	Indian ,,	(Not quoted.)	(Not quoted.)
Gum Arabic—			
Karachi ...	English, per cwt.	30*s.* to 40*s.*	30*s.* to 40*s.*
Madras ...	,, ,,	30*s.* to 40*s.*	27*s.* 6*d.* to 40*s.*
Gum, Kino ...	,, per lb.	9*d.* to 1*s.*	9*d.* to 1*s.*
Myrabolans—			
Bengal ...	English, per cwt.	3*s.* 9*d.* to 4*s.* 3*d.*	3*s.* 9*d* to 4*s.* 3*d.*
Bombay ...	,, ,,	4*s.* 6*d.* to 6*s.* 6*d.*	4*s.* 6*d.* to 6*s.* 6*d.*
Madras ...	,, ,,	4*s.* 6*d.* to 5*s.*	4*s.* 6*d.* to 5*s.*
Myrabolans ...	Indian, per B. Md.	Rs. 2-6 to Rs. 2-8.	Rs. 2-8.
Nux Vomica—			
Bengal ...	English, per cwt.	7*s.* 6*d.* to 8*s.* 6*d.*	8*s.* 6*d.* to 9*s.* 6*d.*
Madras ...	,, ,,	8*s.* to 9*s.*	9*s.* to 10*s.*
Cochin ...	,, ,,	9*s.* 6*d.* to 11*s.*	10*s.* 6*d.* to 12*s.*
Oil, Lemon Grass ...	,, per oz.	(Not quoted.)	5*d.*
,, Rosha Grass ...	Indian, per seer	Rs. 11-8 to Rs. 13-2	Rs. 11-0 to Rs. 11-8.
,, Sandalwood ...	English, per lb.	10*s.* 4*d.* to 11*s.*	10*s.* to 11*s.* 6*d.*
Rosin ...	,, per cwt.	15*s.* 3*d.* to 15*s.* 7½*d.*	15*s.* 3*d.* to 16*s.* 6*d.*
,, ...	Indian ,,	Rs. 16-8 to Rs. 17.	Rs. 16-8 to Rs. 17.
Turpentine ...	English ,,	30*s.* to 38*s.* 6*d.*	35*s.* to 35*s.* 6*d.*
Rubber, India—			
Assam ...	Indian, per B. Md.	Rs. 40 to Rs. 140.	Rs. 50 to Rs. 140.
,, ...	English, per lb.	4*s.*	3*s.* 10*d.*
Burma ...	,, ,,	1*s.* 9*d.* to 3*s.* 8*d.*	1*s.* 9*d.* to 3*s.* 6*d.*
Rubber, Para ...	,, ,,	3*s.* 10¾*d.* to 4*s.* 4¼*d.*	3*s.* 11*d.* to 4*s.* 7*d.*
Seed-lac ...	,, per cwt.	52*s.* 6*d.* to 72*s.* 6*d.*	52*s.* 6*d.* to 72*s.* 6*d.*
Shellac, T. N. Diamond	Indian, per B. Md.	Rs. 31-8 to Rs. 32.	Rs. 31-8.
,, T. N. Orange	English, per cwt.	64*s.* to 66*s.*	62*s.* to 63*s.*
Tamarinds—			
Calcutta ...	,, ,,	10*s.* to 12*s.*	10*s.* to 12*s.*
Madras ...	,, ,,	4*s.* to 5*s.*	4*s.* to 5*s.*
Teak (Selected Indian, 1st class).	Indian, per ton of 50 c.ft.	Rs. 115 to Rs. 135.	Rs. 115 to Rs. 135.

Note.—(1) B. Md. indicates Bengal Maund, which is equal to 80 lbs.

(2) T. N. in Diamond and T. N. Orange are commercial terms applied to certain grades of shellac.

LIST OF BOOKS AND PUBLICATIONS RECEIVED BY THE HONORARY EDITOR DURING DECEMBER 1911.

Agricultural Bulletin of the Straits and Federated Malay States, Vol. X, for November 1911 (two copies).

The Indian Trade Journal for November 30th and December 7th, 14th, 21st and 28th.

Indian Field for November 30th, and December 7th, 14th, 21st and 28th.

Report on the Operations of the Department of Agriculture, Burma, for the year ending 30th June 1911.

The Cyprus Journal, for October 1911.

Indian Engineering, for December 2nd, 9th, 16th and 23rd.

The Nagpur Law Reports, Vol. VII, Part XI, November 1911.

Revue des Eaux et Forêts, No. 22, for November 1911.

Forestry Quarterly, Vol. IX, No. 1.

A Critical Revision of the Genus Eucalyptus, Vol. II, Part 3.

The Tropical Agriculturist for November 1911.

Circulars and Agricultural Journal of the Royal Botanical Gardens, Ceylon, Vol. VI, Nos. 1—5.

American Forestry, for November 1911.

Tropical Life for November 1911.

Report on the Forest Administration in Coorg during the year 1910-11.

Administration Reports, 1910-11, Part IV, Royal Botanic Gardens, Ceylon.

Annals of the Royal Botanic Gardens, Peradeniya, Vol. V, Part II, for May 1911.

Bulletin Economique publié par L'Inspecteur-Conseil des Services Agricoles et Commerciaux, No. 92.

Report of the Agricultural Department, Eastern Bengal and Assam, for the year ending 30th June 1911.

Report on the Operations of the Department of Agriculture, Madras Presidency, for 1910-11.

Report of the First Agricultural and Co-operative Conference, Burma, held at Mandalay on July 18th to 21st, 1911.

Botanical Gazette, for November 1911, No. 5, Vol. LII.

Bulletin of the Imperial Institute, Vol. IX, No. 3, 1911.

Coronation Arbour Day in India of His Imperial Majesty the King-Emperor George V of Great Britain and India by Pandit Sunder Lall Pathack.

University of California Publications, California White Wheats, Bulletin No. 212; The Principles of Wine-making, Bulletin No. 213; Citrus Fruit Insects, Bulletin No. 214.

The Indian and Eastern Engineer, for December 1911.

Annual Report of the Director of Forestry of the Philippine Islands for the fiscal year ended June 30th, 1911.

Opportunities for Lumbering in the Philippine Forests, Circular No. 4.

Printed at the Pioneer Press, by GEO. SIM, No. 2307—14-2-'12.

GAZETTE NOTIFICATIONS.

1.—Gazette of India.

Nil.

2.—Madras Gazette.

22*nd December* 1911.—*Posting.*—M. R. Ry. V. Subramania Aiyar, Extra Assistant Conservator of Forests, to do duty under the District Forest Officer, South Coimbatore.

26*th December* 1911.—No. 5.—The following posting of a Forest Officer is ordered:—

Mr. F. R. Madan, Assistant Conservator of Forests, to do duty under the District Forest Officer, Guntur.

4*th January* 1912.—No. 12.—The following postings of Forest Officers are ordered :—

Mr. Thomas Pendril Peake, Deputy Conservator of Forests, on return from leave, *to be* District Forest Officer, Tinnevelly.

Mr. Alfred Bertwright Myers, Extra Assistant Conservator of Forests, on return from leave, *to be* District Forest Officer, Ramnad, and to hold charge of the Tinnevelly district in addition to his own duties pending the arrival of Mr. Peake.

3.—Bombay Gazette.

11*th January* 1912.—No. 2800.—Mr. R. K. Kanitkar, Extra Assistant Conservator of Forests, delivered over and Mr. W. F. D. Fisher, Acting Conservator of Forests, N. C., received charge of the Working Plans Division, N. C., on the 6th day of January 1912, in the afternoon.

4.—Bengal Gazette.

8*th January* 1912.—No. 1.—*Forests.*—Mr. O. A. Dodsworth, Probationary Extra Assistant Conservator of Forests, is transferred from the Sunderbans Division to the Singhbhum Division as an attached officer.

5.—Eastern Bengal and Assam Gazette.

4*th January* 1912.—No. 44F.—Mr. Poresh Nath Mukharji, Extra Assistant Conservator of Forests, was permitted to return to duty on the 2nd May 1911. He was attached to the Jalpaiguri Forest Division for two days, *i.e.*, for 2nd and 3rd May 1911, and then resumed charge of the Lower Tondu Range in that Division.

8*th January* 1912.—No. 101F.—Mr. L. Delanougerede, Probationary Extra Assistant Conservator of Forests, attached to the Chittagong Forest Division, is transferred and attached to the Chittagong Hill Tracts Forest Division.

11*th January* 1912.—No. 151F.—Mr. Probodh Chandra Chattarji, Officiating Extra Assistant Conservator of Forests, was allowed privilege leave for one month, under article 260 of the Civil Service Regulations, with effect from the 24th November 1911.

6.—United Provinces Gazette.

Nil.

7.—Punjab Gazette.

10*th January* 1912.—No. 28.—*Notification.*—Mian Budhi Singh, Forest Ranger, 2nd grade, sub. *pro tem.*, officiated as Extra Assistant Conservator of Forests, with effect from the forenoon of 2nd July 1911 to the afternoon of 30th September 1911, during

the absence of Munshi Imam-ud-din, Extra Assistant Conservator of Forests, on privilege leave.

15th January 1912.—No. 39.—*Notification.*—Messrs. H. M. Glover, Assistant Conservator of Forests, and C. G. Trevor, Deputy Conservator of Forests, respectively made over and received charge of the Kulu Division on the afternoon of the 23rd December 1911, consequent on the former's departure on three months' privilege leave from the same date.

No. 42.—*Notification.*—In consequence of his transfer from the Rawalpindi to the Lahore Forest Division, Mr. E. A. Greswell, Assistant Conservator of Forests, made over charge of his duties at Rawalpindi on the forenoon of the 2nd January 1912, and took over charge of his duties as an Attached Officer at Lahore on the afternoon of 2nd January 1912.

8.—Central Provinces Gazette.

Nil.

9.—Burma Gazette.

18th December 1911.—No. 49.—Mr. A. P. Davis, Assistant Conservator of Forests, assumed charge of his duties in the Pyinmana Forest Division, to which he was posted in Revenue (Forest) Department Notification No. 240, dated the 9th December 1911, on the forenoon of 13th December 1911.

No. 37.—Mr. C. H. Hearsey, Forest Ranger, 1st grade, in charge of Kanbalu Range of Mu Forest Division, availed himself of the fifteen months' combined leave (three months' privilege leave combined with one year's furlough) granted him in this Office Order No. 37 of 1911-12, dated 2nd November 1911, on the afternoon of 13th December 1911 and Mr. C. Lindsay-Smith, Probationary Extra Assistant Conservator of Forests, assumed charge of the Kanbalu Range with head-quarters at Kanbalu on the same date.

21st December 1911.—No. 38.—With reference to Revenue (Forest) Department Notification No. 222, dated 27th November 1911, and in continuation of this office Notification No. 36, dated 15th December 1911, Mr. J. W. Bradley, Assistant Conservator of Forests, resumed charge of his duties in the Katha Forest Division on the afternoon of 15th December 1911.

23rd December 1911.—No. 50.—With reference to Revenue (Forest) Department Notification No. 240, dated the 6th December 1911, Mr. A. P. Davis, Assistant Conservator of Forests, relinquished charge of the special timber measuring duty in the Yaw Forest Division on the afternoon of the 9th December 1911.

No. 51.—With reference to Revenue (Forest) Department Notification No. 241, dated the 6th December 1911, Mr. C. Gwyer, Assistant Conservator of Forests, relinquished charge of his special timber measuring duty in the Yaw Forest Division on the afternoon of the 8th December 1911.

28th December 1911 —No. 40.—With reference to Revenue (Forest) Department Notification No. 242, dated the 6th December 1911, Mr. G. H. A. Goldberg, Assistant Conservator of Forests, assumed charge of his duties in the Tharrawaddy Forest Division on the forenoon of the 3rd November 1911.

No. 41.—With reference to Revenue (Forest) Department Notification No. 245, dated the 15th December 1911, Mr. A. W. Moodie, Assistant Conservator of Forests, assumed charge of his duties in the Tharrawaddy Forest Division on the forenoon of the 22nd December 1911.

No. 42.—With reference to Revenue (Forest) Department Notifications Nos. 221 and 225, dated the 27th November 1911, Mr. R. C. V. Palmer, Extra Assistant Conservator of Forests, made over, and Mr. W. Lawton, Assistant Conservator of Forests, received, charge of the duties of the Timber Assistant in the Prome Forest Division, on the afternoon of 19th December 1911.

No. 43.—With reference to Revenue (Forest) Department Notifications Nos. 225 and 226, dated the 27th November 1911, Mr. E. V. Ellis, Deputy Conservator of Forests, made over and Mr. R. C. V. Palmer, Extra Assistant Conservator of Forests, received charge of the duties of the Timber Assistant in the Zigôn Forest Division on the afternoon of 21st December 1911. From the same date Mr. Ellis assumed charge of his duties as Working Plan Officer in the Tharrawaddy Forest Division.

2nd January 1912.—No. 1.—With reference to Revenue (Forest) Department Notification No. 239, dated the 5th December 1911, Mr. D. P. Hewett, Assistant Conservator of Forests, received charge of the Thaungyin Forest Division from Mr. G. F. R. B. Thurling, Deputy Conservator of Forests, on the forenoon of 21st December 1911.

No. 2.—With reference to Revenue (Forest) Department Notification No. 248, dated the 15th December 1911, Mr. C. K. Hargreaves assumed charge of his duties in the Toungoo Forest Division on the forenoon of the 21st December 1911.

4th January 1912.—No. 1.—Mr. G. H. A. Goldberg, Assistant Conservator of Forests, relinquished charge of his timber measuring duties in the Yaw Forest Division to which he was posted in Revenue (Forest) Department Notification No. 155 of 20th September 1911 on the afternoon of the 31st October 1911.

4th January 1912.—No. 1.—With reference to Revenue (Forest) Department Notification No. 233, dated the 30th November 1911, Mr. C. V. Ryan, Extra Assistant Conservator of Forests, made over, and Mr. J. J. Rorie, Deputy Conservator of Forests, received, charge of the Bhamo Forest Division, on the forenoon of the 30th December 1911.

5th January 1912.—No. 1.—On return from leave Mr. H. H. Forteath, Deputy Conservator of Forests, is posted to special duty at the head-quarters of the Toungoo Forest Division.

5th January 1912.—No. 1.—With reference to Revenue (Forest) Department Notification No. 241, dated the 6th December 1911, Mr. C. Gwyer, Assistant Conservator of Forests, assumed charge of his duties in the Thayetmyo Forest Division, on the forenoon of 13th December 1911.

TIMBER AND PRODUCE TRADE.

C. LEARY & CO.'S LONDON MARKET REPORT.

1st to 30th December 1911.

EAST INDIA TEAK—*Timber.*—Burma and Siam.—The enquiry for all classes has been very limited, and little business has been done ; values show no change. *Planks.*—Sales have been hindered by the difference between buyers' and sellers' ideas of value, as there has been some demand, which sellers, however, have only been willing to satisfy at enhanced rates. Quotations are : Timber £14 to £25 (Java £9 to £17) ; Flitches £16 to £22 (Hewn Java £10 to £16) ; Planks £13 10*s.* to £25 (Java £12 to £16) ; all per load on c.i.f. terms. The arrivals of Timber were 94 loads from Burma and 149 loads from Java. The analysis of deliveries and stocks is as follows :—

	Deliveries for December. Loads.		Deliveries to 30th Deeember. Loads.		Dock Stock. Loads	
	Timber.	*Planks.*	*Timber.*	*Planks.*	*Timber.*	*Planks.*
1911 ...	262	202	2,680	3,234	4,501	3,901
1910 ...	214	314	3,184	3,659	1,654	2,968
1909 ...	1,016	349	4,274	2,842	1,550	3,008

PADOUK.—There is only a limited enquiry.

PENCIL CEDAR.—First-class logs of large size only are required, worth about 3s. upwards per foot cube, calliper measure.

SATINWOOD.—East India.—Well figured logs would obtain full prices, but inferior wood should not be shipped. Quotations in parcel are 6*d.* to 1*s.* 6*d.* for East India.

ROSEWOOD.—East India.—The demand is fairly active and there is a favourable outlet for fresh supplies ; we quote £7 to £15 per ton.

EBONY.—Ceylon.—There is a fair outlet for small supplies. East India.—Consignments of logs of good sizes and character can be advised. Quotations are—Ceylon £7 to £15 per ton, East India £6 to £12.

MARKET RATES FOR FOREST PRODUCTS.

Name of Product.	Quotations, English or Indian.	Rates for Dec. 1911.	Rates for Jan. 1912.
Cardamoms ...	English per lb.	2*s*. 1*d*. to 3*s*. 8*d*.	2*s*. 2*d*. to 4*s*. 3*d*.
Croton Seeds ...	,, ,, cwt	70*s*. to 75*s*.	70*s*. to 75*s*
Cutch ...	,, ,, ,,	27*s*. 6*d*. to 36*s*. 6*d*.	30*s*. to 37*s*.
,, (Tablets) ...	Burma ,, ,,	(Not quoted.)	Rs. 53 to Rs. 57.
Gum Arabic—			
Karachi ...	English ,, ,,	30*s*. to 40*s*.	30*s*. to 40*s*.
Madras ...	,, ,, ,,	27*s*. 6*d*. to 40*s*.	27*s*. 6*d* to 40*s*.
Gum Kino ...	,, ,, lb.	9*d*. to 1*s*.	9*d*. to 1*s*
Myrabolans—			
Bengal ...	,, ,, cwt.	3*s*. 9*d*. to 4*s*. 3*d*.	3*s*. 9*d*. to 4*s*. 3*d*.
Bombay ...	,, ,, ,,	4*s* 6*d*. to 6*s*. 6*d*.	4*s*. 6*d*. to 6*s*. 6*d*.
Madras ...	,, ,, ,,	4*s*. 6*d*. to 5*s*.	4*s*. 6*d*. to 5*s*.
Myrabolans ...	Indian per B. Md.	Rs. 2-8.	Rs. 2-4 to Rs. 2-8.
Nux Vomica—			
Bengal ...	English per cwt.	8*s*. 6*d*. to 9*s*. 6*d*.	8*s*. 6*d*. to 9*s*. 6*d*.
Madras ...	,, ,, ,,	9*s*. to 10*s*.	9*s*. to 10*s*.
Cochin ...	,, ,, ,,	10*s* 6*d*. to 12*s*.	10*s*. 6*d*. to 12*s*.
Oil, Lemon Grass ...	,, ,, oz.	5*d*.	$4\frac{3}{4}$*d*. to 5*d*.
,, Rosha Grass ...	Indian per seer	Rs. 11 to Rs. 11-8.	Rs. 9-8 to Rs. 11-4.
,, Sandalwood ...	English per lb.	10*s*. to 11*s*. 6*d*.	11*s*. 6*d*.
Rosin ...	,, ,, cwt.	15*s*. 3*d*. to 16*s*. 6*d*.	17*s*. to 17*s*. 6*d*.
,, ...	Indian ,, ,,	Rs. 16-8 to Rs 17.	Rs. 16-8 to Rs. 17.
Turpentine ...	English ,, ,,	35*s*. to 35*s*. 6*d*.	36*s*. 9*d*. to 38*s*.
Rubber, India—			
Assam ...	Indian, per B. Md.	Rs. 50 to Rs. 140.	Rs. 50 to Rs. 150.
,, ...	English per lb.	3*s*. 10*d*.	4*s*.
Burma ...	,, ,, ,,	1*s*. 9*d*. to 3*s*. 6*d*.	1*s*. 9*d*. to 3*s*. 9*d*.
Rubber, Para ...	,, ,, ,,	3*s*. 11*d*. to 4*s*. 7*d*.	4*s*. 2*d*. to 4*s*. $6\frac{1}{2}$*d*.
Seed-lac ...	,, ,, cwt.	52*s* 6*d*. to 72*s*. 6*d*.	52*s*. 6*d* to 72*s*. 6*d*.
Shellac, T.N. Diamond.	Indian, per B. Md.	Rs. 31-8	Rs. 30 to Rs. 31-8.
,, T.N. Orange.	English per cwt.	62*s*. to 63*s*.	63*s*. to 64*s*.
Tamarinds—			
Calcutta ...	,, ,, ,,	10*s*. to 12*s*.	10*s*. to 12*s*.
Madras ...	,, ,, ,,	4*s*. to 5*s*.	4*s*. to 5*s*.
Teak (Selected Indian, 1st class) ...	Indian, per ton of 50 c.ft.	Rs. 115 to Rs 135	Rs. 110 to Rs. 140.

Note.—(1) B. Md. indicates Bengal Maund, which is equal to 80 lbs.
(2) T. N. in Diamond and T. N. Orange are commercial terms applied to certain grades of shellac.

LIST OF BOOKS AND PUBLICATIONS RECEIVED BY THE HONORARY EDITOR DURING JANUARY 1912.

American Forestry for December 1911.

Report on the Management of the Provincial and District Gardens of the Central Provinces for 1910-11.

Administration Report of the Forest Department of H. H. The Nizam's Dominions for the Fasli year 1318 (7th October 1908 to 6th October 1909 A.D.)

Forest Conservancy Administration Report, Ceylon, 1910-11.

India Rubber World for December 1911.

Canadian Forestry Journal for September-October 1911, Vol. VII, No. 5.

Cyprus Annual Report of the Director of Agriculture for 1910-11.

Proceedings of the Agri-Horticultural Society of Madras, July-September 1911.

Agricultural Bulletin of the Straits and Federated Malay States, Vol. X, No. 12, for December 1911 (two copies.)

Indian Trade Journal for January 4th, 11th, 18th and 25th, 1912.

Indian Field for January 4th, 11th, 18th.

Indian Engineering for January 6th, 13th, 20th.

Season and Crop Report of the the Bombay Presidency for 1910-11.

Department of the Interior, Canada, Forest Products of Canada, 1910, Bulletin No. 12, Poles purchased ; Bulletin No. 22, Cross-ties purchased ; Bulletin No. 23, Timber used in Mining Operations.

Report on the Agricultural Stations in the Central Provinces and Berar for 1910-11.

Report of Proceedings of the Fifth Annual Convention of the Western Canada Irrigation Association held at Calgary, Alta, August 8th, 9th, and 10th, 1911.

Revue des Eaux et Forêts, No. 24 for December 1911 and No. 1 for January 1912.

Indian Law Reports, Madras Series, for October 1911.

The Indian and Eastern Engineer for January 1912.

The Tropical Agriculturist for December 1911.

Quarterly Journal of Forestry, January 1912, Vol. VI, No. 1 of the Royal English Arboricultural Society.

The Botanical Gazette for December 1911.

Memoirs of the Department of Agriculture in India, Vol. IV, No. 3, Notes on the Incidence and Effect of Sterility and of Cross-fertilisation in the Indian Cottons.

Ninth Report on Forest Experiments, Bureau of Forestry, Department of Agriculture and Commerce, Tokyo, Japan.

Accounts of the Trade carried by Rail and River in India in the Official Year 1910-11 and the four preceding years

Printed at the Pioneer Press, by GEO. SIM, No. 48—26-2-12.

GAZETTE NOTIFICATIONS.

1.—Gazette of India.

12th February 1912.—No. 456-C.F.—Mr. F. J. Branthwaite, Conservator of Forests, 3rd grade, Burma, on leave, is permitted to retire from the service of Government with effect from the 9th December 1911.

From the same date Mr. A. W. Blunt, Officiating Conservator, 3rd grade, Central Provinces, is confirmed in that grade.

2.—Madras Gazette.

18th January 1912.—No. 35.—Under article 260 of the Civil Service Regulations' Khan Sahib Saiyid Burhanuddin Sahib Bahadur, District Forest Officer, Nellore, is granted privilege leave for three months with effect from the date of relief.

22nd January 1912.—*Posting.*—M. R. Ry. K. Gajaraja Mudaliyar, Extra Assistant Conservator of Forests, to do duty under the District Forest Officer, Trichinopoly *cum* Tanjore.

No. 43.—The following postings of Forest Officers are ordered :—

M. R. Ry. V. Subramania Aiyar Avargal, Extra Assistant Conservator of Forests, to act as District Forest Officer, Nellore, during the absence on leave of Khan Sahib Saiyid Burhanuddin Hussain Sahib Bahadur or until further orders.

29th January 1912.—M. R. Ry. K. R. Venkataramana Aiyar Avargal, Extra Assistant Conservator of Forests, to be District Forest Officer, South Arcot, with effect from date of joining that appointment.

1st February 1912.—No. 59.—The following posting of a Forest Officer is ordered :—

Mr. Thomas Clear, Assistant Conservator of Forests, doing duty under the District Forest Officer, North Salem, to act as District Forest Officer, South Canara, during the absence of Mr. D. T. Barry on special duty or until further orders (*vide* G. O. No. 252, Revenue, dated 29th January 1912). *To join expeditiously.*

15th February 1912.—No. 70.—The Right Honourable the Secretary of State for India has been pleased to grant an extension of leave on medical certificate for six months to Mr. C. D. McArthy, Deputy Conservator of Forests.

13th February 1912.—No. 71.—The services of Mr. E. M. Crothers, Extra Assistant Conservator of Forests, are placed at the disposal of the Honourable the Chief Commissioner of Coorg.

3.—Bombay Gazette.

15th January 1912.—No. 5937.—Messrs. A. C. Hiley, Assistant Conservator of Forests, and G. J. Rege, Extra Assistant Conservator of Forests, respectively delivered over and received charge of the Sub-Divisional Forest Office, Kanara Southern Division, on the forenoon of the 3rd January 1912.

17th January 1912.—No. 3839.—Mr. H. W. Starte, Assistant Conservator of Forests, who was attached temporarily to the Poona Division, and subsequently transferred to the North Khandesh Division and placed under the orders of the Divisional Forest Officer, North Khandesh, reported himself for duty to the latter officer on the forenoon of the 3rd January 1912.

9th February 1912.—No. 3052.—Mr. R. K. Kanitkar, Extra Assistant Conservator of Forests, was in charge of the Famine Fodder Operations of Bassein and Mahim Ranges from 7th to 17th January 1912, both days inclusive.

Mr. G. E. Marjoribanks, Deputy Conservator of Forests, delivered over and Mr. R. K. Kanitkar, Extra Assistant Conservator of Forests, received charge of the office of the Sub-Divisional Forest Officer, Surat, on the 25th January 1912 in the afternoon.

10th February 1912.—No. 3085.—Mr. C. E. L. Gilbert, Deputy Conservator of Forests, delivered over and Mr. R. W. Inder, Assistant Conservator of Forests, received charge of the office of the Divisional Forest Officer, Central Thana, on the 27th day of January 1912, in the forenoon.

13th February 1912.—6599.—Mr. R. W. Inder, Assistant Conservator of Forests, S. C., appointed Divisional Forest Officer, Central Thana, in Government Notification No. 432, dated 16th January 1912, was relieved of his duties in the Southern Circle on the afternoon of the 23rd January 1912.

4.—Bengal Gazette.

23rd January 1912.—No. 447 F.—Mr. W. Breakey, Extra Assistant Conservator of Forests, is allowed combined leave for six months, *viz.*, privilege leave, under article 260 of the Civil Service Regulations for one month and twenty-seven days, with effect from the 14th December 1911, and leave on medical certificate for the remaining period under article 336 of the Regulations.

No. 451 F.—*23rd January* 1912.—Mr. J. W. A. Grieve, Deputy Conservator of Forests, in charge of the Darjeeling Division, is allowed combined leave for nine months, *viz.*, privilege leave, under article 260 of the Civil Service Regulations, for two months and seven days, with effect from the 25th March 1912, or any subsequent date on which he may be relieved, and furlough for the remaining period under article 308 (*b*) of the Regulations.

5.—Eastern Bengal and Assam Gazette.

29th January 1912.—No. 502F.—Mr. A. J. W. Milroy, Assistant Conservator of Forests, was appointed to hold charge of the Jalpaiguri Forest Division, from the 31st October 1911 to the 8th November 1911, both days inclusive.

This cancels Notification No. 6347F., dated the 20th December 1911.

31st January 1912.—No. 621F.—Mr. Probodh Chandra Chatterji, Officiating Extra Assistant Conservator of Forests, is confirmed in that appointment, with effect from the 1st April 1911, *vice* Mr. Kripa Nath De, retired.

14th February 1912.—No. 862-F.—The following notification issued by the Government of India in the Department of Revenue and Agriculture is republished :—

No. 371.—*C. F., dated the 7th February* 1912.—The undermentioned officers, who have been appointed by His Majesty's Secretary of State to the Forest Department in India, are appointed to be Assistant Conservators of Forests, with effect from the dates specified opposite their names and are posted to the provinces named below :—

* * * * * *

Mr. A. R. Thomas, Eastern Bengal and Assam, 22nd December 1911.

Mr. J. R. P. Gent, Eastern Bengal and Assam, 19th December 1911.

* * * * * *

14th February 1911.—No. 863-F.—The undermentioned officers, who have been appointed to be Assistant Conservators of Forests in this province, are attached to the Forest Divisions noted against their names :—

Mr. A. R. Thomas	... ...	... Goalpara Forest Division.
Mr. J. R. P. Gent	... ...	... Buxa Forest Division.

6.—United Provinces Gazette.

29th January 1912.—No. 18.—Mr. R. G. Marriott, Assistant Conservator of Forests, attached to the Haldwani Forest Division of the Eastern Circle, is transferred to Bahraich Forest Division of the same Circle, as an attached officer.

7.—Punjab Gazette.

19*th January* 1912.—No. 58.—*Notification.*—Lala Atma Ram, Extra Assistant Conservator of Forests, is granted one month and twenty-seven days' privilege leave with effect from the 2nd January 1912.

22*nd January* 1912.—No. 67.—*Notification.*—Mr. O. H. Walters, who has been appointed by His Majesty's Secretary of State for India an Assistant Conservator of Forests and posted to the Punjab, reported his arrival at Bombay on the forenoon of the 20th December 1911 and took over charge of his duties as an attached officer at Rawalpindi on the forenoon of the 3rd January 1912.

26*th January* 1912.—No. 74.—*Notification.*—Consequent on his transfer to the Kulu Forest Division, Mr. C. G. Trevor made over charge of his duties in the Bashahr Division on the forenoon of 17th December 1911.

No. 77.—*Notification.*—Mr. R. N. Parker, Deputy Conservator of Forests, Punjab, made over charge of his duties under Government on the afternoon of the 28th December 1911 and proceeded on deputation temporarily to the Jaipur State.

7*th February* 1912.—No. 371 *C. F.*—The undermentioned officers who have been appointed by His Majesty's Secretary of State to the Forest Department in India are appointed to be Assistant Conservator of Forests with effect from the dates specified opposite their names, and are posted to the provinces named below :—

* * * * * * * *

Mr. O. H. Walters, Punjab—19th December 1911 (afternoon).

* * * * * * * *

13*th February* 1912.—No. 114.—*Notification.*—In consequence of his transfer, Munshi Muhammad Afzal, Probationary Extra Assistant Conservator of Forests, made over charge of his duties in the Bashahr Forest Division on the afternoon of the 6th January and assumed charge of his duties in the Hazara Division on the afternoon of the 22nd January 1912.

21*st February* 1912.—No. 136.—*Notification.*—In consequence of his transfer Lala Sunder Das, Extra Assistant Conservator of Forests, made over charge of his duties in the Direction Division on the afternoon of the 14th January and assumed charge of his duties in the Lahore Division on the forenoon of the 15th idem.

8.—Central Provinces Gazette.

22*nd January* 1912.—No. 160.—The following transfers among Assistant Conservators of Forests are ordered :—

Mr. C. E. C. Cox, from the Hoshangabad to the South Chanda Forest Division.

Mr. L. Mason, from the Direction Division, Northern Circle, to the Hoshangabad Forest Division.

7*th February* 1912.—No. 371 *C. F.*—The undermentioned officers, who have been appointed by His Majesty's Secretary of State to the Forest Department in India, are appointed to be Assistant Conservators of Forests with effect from the dates specified opposite their names and are posted to the provinces named below :—

* * * * * * *

Mr. C. M. Harlow, Central Provinces—23rd December 1911 (afternoon).

* * * * * * *

9*th February* 1912.—No. 396 *F. C.*—With reference to the Notification of this Department, No. 1137-F.—216-12, dated the 28th November 1911, the following promotion is made with effect from the 22nd December 1911, the date from which the furlough of Mr. C. P. Fisher, Conservator of Forests, 2nd grade, commences and until further orders :—

Mr. H. H. Haines, Conservator of Forests, 3rd grade, to officiate as Conservator of Forests, 2nd grade.

9.—BURMA GAZETTE.

13*th December* 1911.—No. 1180-*F.*-131-17.—On return from combined leave, Mr. M. Hill, Conservator, 2nd grade, assumed charge of the Office of Conservator of Forests, Northern Circle, Central Provinces, with effect from the afternoon of 30th November 1911, the date on which he relieved Mr. H. H. Forteath, Officiating Conservator of Forests, 3rd grade.

From the same date the following reversions take place :—

Mr. H. H. Forteath, Officiating Conservator, 3rd grade, Central Provinces, reverts to his substantive appointment in the class of Deputy Conservators in Burma.

8*th January* 1912.—No. 2.—With reference to Revenue (Forest) Department Notification No. 234, dated the 30th November 1911, Mr. C. V. Ryan, Extra Assistant Conservator of Forests, took over charge of the Shwegu Forest Subdivision of the Bhamo Forest Division on the forenoon of the 2nd January 1912, from Mr. A. E. Elmore, Forest Ranger. From same date Mr. Elmore remains attached to Shwegu Subdivision.

17*th January* 1912.—No. 2.—Mr. R. Unwin, Assistant Conservator of Forests, assumed charge of his duties in the Pyinmana Forest Division, to which he was posted in Revenue (Forest) Department Notification No. 246, dated the 15th December 1911, on the forenoon of 22nd December 1911.

18*th January* 1912.—No. 4.—With reference to this Department Notification No. 244, dated the 15th December 1911, Mr. J. M. D. Mackenzie, Assistant Conservator of Forests, reported his arrival in Rangoon on the 15th January 1912, before noon.

No. 5.—Mr. A. W. Moodie, Assistant Conservator of Forests, attached to the Tharrawaddy Forest Division, is transferred and attached to the Zigôn Forest Division.

No. 6.—On relief by Mr. B. R. Hutchins, Extra Assistant Conservator of Forests, of the charge of the Railway Revenue Range, Toungoo Forest Division, Mr. R. C. A. Pinder, Extra Assistant Conservator of Forests, was placed on special duty in that Division from the 29th June to the 7th July 1911.

24*th January* 1912.—No. 3.—With reference to Revenue (Forest) Department Notification No. 244, dated the 15th December 1911, Mr. J. M. D. Mackenzie, Assistant Conservator of Forests, assumed charge of his duties in the office of the Upper Chindwin Forest Division on the forenoon of the 23rd January 1912.

2*nd February* 1912.—No. 3.—Mr. G. C. Cheyne, Assistant Conservator of Forests, resumed charge of his duties in the Ruby Mines Forest Division to which he was posted in Revenue (Forest) Department Notification No. 247, dated the 15th December 1911, on the forenoon of 26th December 1911.

5*th February* 1912.—No. 10.—On the conclusion of the special duty to which he was posted in this Department Notification No. 139, dated the 15th August 1911, Mr. C. E. Milner, Assistant Conservator of Forests, was transferred from Mandalay and was reposted to duty in the Tharrawaddy Forest Division.

No. 11.—Mr. J. W. Bradley, Assistant Conservator of Forests, attached to the Katha Forest Division, is transferred from Katha and is posted to duty in the Upper Chindwin Forest Division.

7*th February* 1912.—No. 12.—On the conclusion of the Working Plans duty to which he was posted in this Department Notification No. 218, dated the 23rd November 1911, Mr. S. F. Hopwood, Deputy Conservator of Forests, is transferred from Monywa and is posted to Working Plans duty in the Yaw Forest Division.

9*th February* 1912.—No. 4.—With reference to Revenue (Forest) Department Notification No. 1, dated the 5th January 1912, Mr. H. H. Forteath, Deputy Conservator of Forests, assumed charge of the special duty in the Toungoo Forest Division on the forenoon of the 25th January 1912.

12*th February* 1912.—No. 6.—With reference to Revenue (Forest) Department Notification No. 11, dated the 5th February 1912, Mr. J. W. Bradley, Assistant Conservator of Forests, was relieved of his duties in the Katha Division on the afternoon of 25th January 1912, and assumed charge of his duties in the Upper Chindwin Division, on the forenoon of 3rd February 1912.

TIMBER AND PRODUCE RATES.

C. LEARY AND CO.'S LONDON MARKET REPORT.

1st to 31st January 1912.

EAST INDIA TEAK.—*Timber.*—Burma and Siam wood have been in better request during the past month and values have hardened materially, buyers appearing to realise that they are face to face with a probably inadequate supply. The sales made should suffice to keep the market firm for some months, even with only a moderate enquiry and there still appears to be a number of orders waiting to be placed. Java has not participated in the improvement. *Planks.*—All conversion specifications have improved in value more or less, although for the more ordinary specifications of planks sellers are still unable to obtain the prices which they consider the strength of the position justifies. Java are only seldom asked for. Quotations are : Timber £14 to £25 (Java £9 to £17) ; Flitches £16 to £22 (Hewn Java £10 to £16) ; Planks, £13 10s. to £25 (Java £12 to £16) ; all per load on c.i.f. terms. The arrivals of Timber were 169 loads from Burmah. The analysis of deliveries and stocks is as follows :—

	Deliveries for January. Loads.		Deliveries to 31st January. Loads.		Dock Stock. Loads.	
	Timber.	*Planks.*	*Timber.*	*Planks.*	*Timber.*	*Planks.*
1912 ...	327	491	327	491	4,271	3,710
1911 ...	145	311	145	311	1,673	2,819
1910 ...	109	221	109	221	1,679	2,971

PADOUK—Is in little request and shipments cannot be advised.

PENCIL CEDAR.—The demand is restricted to large clean timber and values are about 3*s.* upwards per foot cube, calliper measure.

SATINWOOD.—East India.—The demand is restricted and only large or well-figured logs should be shipped. Quotations in parcel are 6*d.* to 1*s.* 6*d.*

ROSEWOOD.—East India.—The tone continues satisfactory and further shipments can be recommended ; we quote £7 to £15 per ton.

EBONY.—Ceylon.—Prime logs might be shipped to advantage. East India.—There is a fair outlet for limited quantities. Quotations are :—Ceylon £7 to £15 per ton, East India £6 to £12.

MARKET RATES FOR FOREST PRODUCTS.

Name of Product.	Quotations, English or Indian.	Rates for Jany. 1912.	Rates for Feby. 1912.
Cardamoms ...	English, per lb.	2*s.* 2*d.* to 4*s.* 3*d.*	2*s.* 3*d.* to 4*s.* 3*d.*
Croton Seeds ...	,, ,, cwt.	70*s.* to 75*s.*	70*s.* to 75*s.*
Cutch ...	,, ,, ,,	30*s.* to 37*s.*	30*s.* to 37*s.* 6*d.*
,, (Tablets) ...	Burma ,, ,,	Rs. 53 to Rs. 57.	Rs. 50.
Gum Arabic—			
Karachi ...	English, ,, ,,	30*s.* to 40*s.*	27*s.* 6*d.* to 35*s.*
Madras ...	,, ,, ,,	27*s.* 6*d.* to 40*s.*	27*s.* 6*d.* to 40*s.*
Gum, Kino ...	,, ,, lb.	9*d.* to 1*s.*	9*d.* to 1*s.*
Myrabolans—			
Bengal ...	,, ,, cwt.	3*s.* 9*d.* to 4*s.* 3*d.*	3*s.* 9*d.* to 4*s.* 3*d.*
Bombay ...	,, ,, ,,	4*s.* 6*d.* to 6*s.* 6*d.*	4*s.* 6*d.* to 6*s.* 6*d.*
Madras ...	,, ,, ,,	4*s.* 6*d.* to 5*s.*	4*s.* 6*d.* to 5*s.*
Myrabolans ...	Indian, per B. Md.	Rs. 2-4 to Rs. 2-8.	Rs. 2-4 to Rs. 2-9.
Nux Vomica—			
Bengal ...	English, per cwt.	8*s.* 6*d.* to 9*s.* 6*d.*	7*s.* 6*d.* to 8*s.* 6*d.*
Madras ...	,, ,, ,,	9*s.* to 10*s.*	8*s.* to 9*s.*
Cochin ...	,, ,, ,,	10*s.* 6*d.* to 12*s.*	9*s.* 6*d.* to 11*s.*
Oil, Lemon Grass ...	,, ,, oz.	4¾*d.* to 5*s.*	4¾*d.*
,, Rosha Grass ...	Indian, per seer	Rs. 9-8 to Rs. 11-4.	(Not quoted).
,, Sandalwood ...	English, per lb.	11*s.* 6*d.*	11*s.* 6*d.*
Rosin ...	,, ,, cwt.	17*s.* to 17*s.* 6*d.*	16*s.* 6*d.* to 16*s.* 9*d.*
,, ...	Indian ,, ,,	Rs. 16-8 to Rs. 17.	Rs. 16-8 to Rs. 17.
Turpentine ...	English ,, ,,	36*s.* 9*d.* to 38*s.*	37*s.* 3*d.* to 34*s.* 9*d.*
Rubber, India—			
Assam ...	Indian, per B. Md.	Rs. 50 to Rs. 150.	Rs. 50 to Rs. 150.
,, ...	English, ,, lb.	4*s.*	4*s.* 3*d.*
Burma ...	,, ,, ,,	1*s.* 9*d.* to 3*s.* 9*d.*	2*s.* to 3*s.* 10*d.*
Rubber, Para ...	,, ,, ,,	4*s.* 2*d.* to 4*s.* 6½*d.*	4*s.* 6¼*d.* to 4*s.* 7¼*d.*
Seed-lac ...	,, ,, cwt.	52*s.* 6*d.* to 72*s.* 6*d.*	52*s.* 6*d.* to 62*s.* 6*d.*
Shellac, T. N. Diamond	Indian, per B. Md.	Rs. 30 to Rs. 31-8.	Rs. 30 to Rs. 31-8.
,, T. N. Orange	English, ,, cwt.	63*s.* to 64*s.*	60*s.* to 63*s.* 6*d.*
Tamarinds—			
Calcutta ...	,, ,, ,,	10*s.* to 12*s.*	10*s.* to 12*s.*
Madras ...	,, ,, ,,	4*s.* to 5*s.*	4*s.* to 5*s.*
Teak (Selected Indian, 1st class).	Indian, per ton of 50 c.ft.	Rs. 110 to Rs. 140.	Rs. 115 to Rs. 135.

Note.—(1) B. Md. indicates Bengal Maund, which is equal to 80 lbs.

(2) T. N. in Diamond and T. N. Orange are commercial terms applied to certain grades of shellac.

LIST OF BOOKS AND PUBLICATIONS RECEIVED BY THE HONORARY EDITOR DURING FEBRUARY 1912.

Transactions of the Royal Scottish Arboricultural Society, Vol. XXVI, Pt. I for January 1912.

University of California Publications, Bulletin No. 215, The House fly in its relation to Public Health; Bulletin No. 216, Progress Report upon Soil and Climatic Factors influencing the Composition of Wheat; Bulletin No. 217, Honey Plants of California Bulletin No. 221, Commercial Fertilizers.

Memoirs of the Department of Agriculture in India, Vol. II, No. 10, Life Histories of Indian Insects, III; Vol. III, Food of Birds in India.

Indian Field for January 25th, February 1st, 8th, 15th and 22nd.

Indian Engineering for January 27th, February 3rd, 10th, 17th and 24th.

India Rubber World for January 1912.

Annals of the Royal Botanic Gardens, Peradeniya, Vol. V, Pt. III.

L'Agronomie Tropicale for October-November and December 1911.

Indian Forest Records, Vol. II, Pt. IV, Host Plants of the Sandal Tree, by M. Rama Rao.

Indian Trade Journal for February 1st, 8th, 15th and 22nd.

Forest Bulletin No. 6, Memorandum on the Oil value of some Sandal woods from Madras, by Puran Singh.

Forest Bulletin No. 7, Note on the Chemistry and Trade Forms of Lac, by Puran Singh.

Memoirs of the Department of Agriculture in India, Records of Drainage in India, Vol. II, No. 2, by Dr. J. W. Leather.

Bulletin Economique No. 93 for November-December 1911.

Reports on the Forest Administration in Burma for the year 1910-11.

Indian Forest Memoirs.—On Some Important Insect Pests of the Coniferæ of the Himalayas with Notes on Some Insects Predaceous and Parasitic upon them, by E. P. Stebbing.

Revue des Eaux et Forêts, Nos. 2 and 3 for 15th January and 1st February 1912 respectively.

Jungle Folk, Indian Natural History Sketches, by Douglas Dewar.

Progress Report of Forest Administration in the Punjab for 1910-11.

Monthly Weather Review for September 1911.

Nagpur Law Reports for December 1911 and January and February 1912.

Reports of the Agricultural Research Institute and College, Pusa, 1910-11.

Commercial America for January 1912.

Canadian Forestry Journal No. 6 for November-December 1911.

Meddelanden Fran Statens Skogsforsoksanstalt, Haflet 8, 1911.

Report on the Working of the Department of Agriculture of the Central Provinces for 1910-11.

Bulletin of the Imperial Institute, Vol. IX, No. 4, 1911.

The Cyprus Journal, Agriculture and Industries of Cyprus, No. 24, January 1912.

Indian and Eastern Engineer, Vol. XXX, No. 2, February 1912.

United States Department of Agriculture.—Experimental Station Record, Vol. XXV, Nos. 7 and 8.

Lower Burma Rulings, Vol. VI, Pt. III, 1911.

Forestry Quarterly for December 1911.

Annual Report of the Department of Agriculture, Bombay Presidency, for 1910-11.

Agricultural Bulletin of the Straits and Federated Malay States for January 1912.

Indian Law Reports, Madras Series, December 1911.

Experiments on the Cultivation of Sugarcane at the Partabgarh Experimental Station 1909–11, Bulletin No. 27, Agricultural Research Institute, Pusa.

Report on the Administration of the Punjab and its Dependencies for 1910-11.

American Forestry for January 1912.

Tropical Agriculturist for January 1912.

Department of Agriculture, Bombay, Bulletin Nos. 44, 45, 46, 47, 48 and 49 of 1911.

Forest Products of Canada, 1910, Bulletin No. 26, Pulpwood; Bulletin No. 27, Tight and Slack Cooperage.

Printed at the Pioneer Press, by GEO. SIM, No. 347—28-3-'12.

GAZETTE NOTIFICATIONS.

1.—Gazette of India.

12th February 1912.—No. 456-C.F.—Mr. F. J. Branthwaite, Conservator of Forests, 3rd grade, Burma, on leave, is permitted to retire from the service of Government with effect from the 9th December 1911.

From the same date Mr. A. W. Blunt, Officiating Conservator, 3rd grade, Central Provinces, is confirmed in that grade.

2.—Madras Gazette.

26th February 1912.—No. 83.—Under articles 260, 233 and 308 (*b*) of the Civil Service Regulations, Mr. H. F. Arbuthnot, District Forest Officer, South Vellore Division, is granted combined privilege leave and furlough without medical certificate for one year and six months with effect from or after the 24th March 1912.

No. 84—Under article 260 of the Civil Service Regulations, M. R. Ry. Rao Bahadur V. Alwar Chetty Garu, District Forest Officer, Bellary, is granted privilege leave for three months with effect from or after the 15th April 1912.

27th February 1912.—*Leave.*—Under article 260 of the Civil Service Regulations, the Board grants to Mr. E. C. M. Mascarenhas, Extra Assistant Conservator of Forests, privilege leave for one month from 1st March 1912 or date of his relief in Coorg.

15th March 1912.—No. 116.—The following postings of Forest Officers are ordered :—

(1) Mr. Charles Joseph Woutersz, District Forest Officer, North Vellore Division, *to be* District Forest Officer, South Vellore Division.

(2) Mr. Theophilus Neville Hearsey, Extra Assistant Conservator of Forests, *to be* District Forest Officer, North Vellore Division.

3.—Bombay Gazette.

23rd February 1912.—No. 1913.—Mr. Nanabhai Dadabhai Sataravala, Extra Deputy Conservator of Forests and Divisional Forest Officer, Satara, is granted privilege leave of absence for three months with effect from 25th February 1912, or the subsequent date on which he may be relieved.

No. 1944.—His Excellency the Governor in Council is pleased to make the following appointment :—

Mr. A. F. Gonsalves to act as Divisional Forest Officer, Satara, *vice* Mr. Nanabhai Dadabhai Sataravala proceeding on leave, pending further orders.

Mr. Ramchandra Vaman Pethe to act as Working Plans Officer, Central Circle *vice* Mr. A. F. Gonsalves, pending further orders.

26th February 1912.—No. 2019.—Mr. Kharshedji Edulji Kotwal, Extra Assistant Conservator of Forests and Sub-Divisional Forest Officer, Western Division, Kanara, is granted privilege leave of absence for three months with effect from the date of relief.

27th February 1912.—No. 2086.—Mr. Dinkar Narayan Damle, Extra Assistant Conservator of Forests and Sub-Divisional Forest Officer, East Khandesh, is granted privilege leave of absence for three months with effect from 1st March 1912, or the subsequent date on which he may be relieved.

9th *March* 1912.—No. 4580.—Messrs. D. N. Damle, Extra Assistant Conservator of Forests, and L. Napier, Deputy Conservator of Forests, respectively delivered over and received charge of the Sub-Divisional Forest Office, East Khandesh, on the forenoon of 1st March 1912.

No. 4583.—Messrs. N. D. Sataravala, L.C.E., Extra Deputy Conservator of Forests, and A. F. Gonsalves, L C.E. Extra Assistant Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, Satara, on the afternoon of 4th March 1912.

10*th March* 1912.—No. 4526.—Messrs. R. V. Pethe, Extra Assistant Conservator of Forests, and E. G. Oliver, Divisional Forest Officer, Poona, respectively delivered over and received charge of the Sub-Division Forest Office, Poona, on the afternoon of 26th February 1912.

15*th March* 1912.—No. 7401.—Mr. K. E. Kotwal, Extra Assistant Conservator of Forests and Sub-Divisional Forest Officer, Kanara, Western Division, granted three months' privilege leave in Government Notification No. 2019, dated 26th February 1912, availed himself of the same with effect from the 16th February 1912, handing over the Sub-Divisional charge to Mr. W. A Miller, Divisional Forest Officer, Kanara, Western Division, on the 15th idem, afternoon.

18*th March* 1912 —No. 4502.—Messrs. A F. Gonsalves and R. V. Pethe, Extra Assistant Conservators of Forests, respectively delivered over and received charge of the Divisional Forest Office, Working Plans, C. C., on the afternoon of 27th February 1912.

4.—Bengal Gazette.

20*th February* 1912.—*No.* 2 *For.*—Mr. H. T. Lewis, Assistant Conservator of Forests, attached to Singhbhum Forest Division, is transferred to the charge of the Tista Forest Division in place of Mr. J. C Carroll, Deputy Conservator of Forests, transferred.

20*th February* 1912.—*No* 3 *For.*—Mr. J. C. Carroll, Deputy Conservator of Forests on relief by Mr. H. T. Lewis, is transferred to the charge of the Singhbhum Forest Division in place of Mr. H. S Gibson, Assistant Conservator of Forests, transferred.

20*th February* 1912.—*No.* 4 *For.*—Mr. H. S. Gibson Assistant Conservator of Forests, on relief by Mr. J. C. Carroll, is transferred to the charge of the Kurseong Forest Division and the Directorship of the Kurseong Forest School in place of Sir H. A. Farrington, Bart., Deputy Conservator of Forests, transferred.

20*th February* 1912.—*No.* 5 *For.*—Sir H. A. Farrington, Bart., Deputy Conservator of Forests, on relief by Mr. H. S. Gibson, is transferred to the charge of the Darjeeling Forest Division in place of Mr. J. W. A. Grieve, proceeding on leave.

22*nd February* 1912.—*No.* 6 *For.*—Mr H. T. Lewis, Assistant Conservator of Forests, is granted privilege leave, under article 260 of the Civil Service Regulations from the 3rd to 22nd January 1912, both days included.

5.—Eastern Bengal and Assam Gazette.

23*rd February* 1912.—No. 970-F.—Mr. A. J. W. Milroy, Assistant Consevator of Forests, on being relieved of his special duty, is appointed to hold charge of the Jalpaiguri Forest Division.

6.—United Provinces Gazette.

Nil.

7.—Punjab Gazette.

23*rd February* 1912.—*No.* 143.—*Notification.*—In consequence of his transfer rom the Direction to the Bashahr Division, Mr. L. B. Holland, Assistant Conservator of Forests, made over charge of his duties at Lahore on the afternoon of the 23rd January 1912, and took over charge of the Bashahr Forest Division from Mr. A J. Gibson, Deputy Conservator of Forests, on the afternoon of the 25th January 1912, from which date the latter officer proceeded on one month and 29 days' privilege leave.

26th February 1912.—*No.* 147.—*Leave.*—Lala Sunder Das, Extra Assistant Conservator of Forests, was granted one month's privilege leave on medical certificate in continuation of six weeks' privilege leave granted him in notification No. 626, dated the 13th December 1911.

8th March 1912. -*No.* 172.—*Notification.*—Mr. R. N. Parker, Deputy Conservator of Forests, deputed temporarily to the Jeypur State by Punjab Government notification No. 77, dated the 26th January 1912, reverted to British service on the afternoon of the 8th February 1912, and assumed charge of his duties as an attached officer in the Direction Division on the forenoon of the 13th idem.

18th March 1912.—*No.* 185.—*Notification.*—On return from privilege leave granted him in Punjab Government notification No. 58 Forests, dated 19th January 1912, Lala Atma Ram, Extra Assistant Conservator of Forests. took over charge of his duties as an attached officer in the Hazara Division on the afternoon of the 28th February 1912.

19th March 1912.—*No.* 191.—*Notification.*—Consequent on the retirement of Lala Daulat Ram, Extra Deputy Conservator of Forests, the following promotions are made, with effect from the 2nd February 1912 :—

Pandit Gokal Das, Extra Assistant Conservator of Forests, to be Ext Deputy Conservator of Forests.

Babu J. N. Mukerji, Extra Assistant Conservator of Forests, sub. *pro tem.*, to be Extra Assistant Conservator of Forests.

Lala Jagan Nath, officiating Extra Assistant Conservator of Forests, to be Extra Assistant Conservator of Forests, sub. *pro tem.*

8.—Central Provinces Gazette.

23rd February 1912.—*No.* 420.—On completion of his duties as Working Plans Officer in the Nagpur-Wardha Forest Division, Mr. A. A. Dunbar-Brander, Deputy Conservator of Forests, is placed on special duty in the Bilaspur District.

1st March 1912 —*No* 464.—The following sub *pro tem.* Extra Assistant Consevator of Forests, on probation are confirmed in their appointments with effect from the 1st January 1912 :—

Mr. W. J. Anthony.
Mr. Chintaman Vishwanath Sarwate.
Mr. Balkrishna Dinkar Ukidwe.

9th March 1912.—*No.* 32.—Mr. Muhammad Ismail, Extra Assistant Conservator of Forests, attached to the South Chanda Division, is transferred. to the Bilaspur Forest Division.

16th March 1912.—*No* 617.—Mr. P. S. Corbould, Deputy Conservator of Forests, attached to the Raipur Forest Division as Working Plans Officer, is appointed to the charge of that Division, *vice* Mr. A. E. Lowrie, who retires from the service on 1st April 1912.

9.—Burma Gazette.

19th February 1912.—*No.* 6.—Maung Tun Tha, A. T. M., Extra Assistant Conservator of Forests, received charge of the Mepale Thaungyin Range, Thaungyin Forest Division, from Ranger Maung Kya Cho on the forenoon of the 16th July 1911.

21st February 1912. *No.* 3.—With reference to Revenue (Forest) Department Notification No 10, dated the 5th February 1912, Mr. C. E. Milner, Assistant Conservator of Forests, assumed charge of his duties in the Tharrawaddy Forest Division, on the forenoon of the 16th October 1911.

5th March 1912.—*No.* 23.—Under the provisions of article 260 of the Civil Service Regulations privilege leave for three months is granted to Mr. G. R. Long, Deputy Conservator of Forests, in charge of the Toungoo Forest Division, with effect from the 10th March 1912, or the subsequent date on which he may avail himself of it.

No. 24.—Mr. N. V. Holberton, Deputy Conservator of Forests, in charge of the Minbu Forest Division, is transferred from Minbu and is posted to the charge of the Toungoo Forest Division, in place of Mr. G. R. Long, Deputy Conservator of Forests, proceeding on leave.

No. 25.—Mr. W. R. French, Extra Assistant Conservator of Forests, in charge of the Magwe Forest Sub-Division, Minbu Forest Division, is transferred from Taungdwingyi and is posted to the charge of the Minbu Forest Division, as a temporary measure, in place of Mr. N. V. Holberton, Deputy Conservator of Forests, transferred.

7th March 1912.—No. 26.—Under the provisions of article 311 of the Civil Service Regulations, furlough on medical certificate for three months is granted to Mr. A. B. Nixon, Assistant Conservator of Forests, attached to the Upper Chindwin Forest Division, with effect from the 22nd February 1912.

14th March 1912.—*No.* 29.—With reference to this Department Notification No. 245, dated the 23rd November 1910, Maung Tun Tha, A.T.M., Extra Assistant Conservator of Forests, was placed in charge of the Mepale-Thaungyin Range, Thaungyin Forest Division, from the 16th July 1911 to the 6th February 1912, after which date he will remain attached to the same division with head-quarters at Tawôkywa.

TIMBER AND PRODUCE RATES.

C. LEARY & CO.'S LONDON MARKET REPORT.

1st to 29th February 1912.

EAST INDIA TEAK.—*Timber.*—The enquiry for Burma and Siam wood has been fully equal to the moderate supplies and values are very firm, buyers in some cases finding difficulty in covering their requirements. Java wood, however, continues dull in tone. *Planks.*—The distance between buyers' and sellers' ideas of value has been bridged to some extent and a certain amount of selling has taken place at full rates. Java has also been in better request, but is difficult to obtain except for distant delivery. Quotations are: Timber £14 to £25 (Java £6. 10*s.* to £20); Flitches, £16 to £24 (Hewn Java £10 to £17); Planks, £13 10*s.* to £25 (Java £12 to £16); all per load on c.i.f. terms. The arrivals of Timber were 176 loads from Burma. The analysis of deliveries and stocks is as follows:—

	Deliveries for February. Loads.		Deliveries to 29th February. Loads.		Dock Stock. Loads.	
	Timber.	*Planks.*	*Timber.*	*Planks.*	*Timber.*	*Planks.*
1912 ...	222	242	549	733	4,154	3,768
1911 ...	362	245	507	556	1,631	3,090
1910 ...	777	162	886	383	1,267	2,963

PADOUK.—There is only a limited enquiry.

PENCIL CEDAR.—*Logs.*—Only the best and largest wood is in request, values ranging from about 3*s.* upwards per foot cube, calliper measure.

SATINWOOD.—East India.—There has recently been more activity in the market, but there is still a considerable stock. Quotations in parcel are 6*d.* to 3*s.* per foot super for Porto Rico, 6*d.* to 1*s.* 6*d.* for St Domingo, and 6*d.* to 1*s.* 6*d* for East India.

ROSEWOOD.—East India.—There is a considerable stock, but moderate supplies of good size and character might still be shipped to advantage; we quote £7 to £15 per ton.

EBONY.—Ceylon.—Limited supplies of prime large logs would be well received. East India.—Sizeable logs of good quality would realise fair rates. Quotations are: Ceylon £7 to £15 per ton, East India £6 to £12.

MARKET RATES FOR FOREST PRODUCTS.

Name of Product.	Quotations, English or Indian.	Rates for Feb. 1912.	Rates for Mar. 1912.
Cardamoms ...	English, per lb.	2*s.* 3*d.* to 4*s.* 3*d.*	2*s.* 3*d.* to 4*s.* 3*d.*
Croton Seeds ...	,, ,, cwt	70*s.* to 75*s.*	70*s.* to 75*s.*
Cutch ...	,, ,, ,,	30*s.* to 37*s.* 6*d.*	28*s.* to 36*s.*
,, (Tablets) ...	Burma, ,, ,,	Rs. 50.	Rs. 47 to Rs. 48.
Gum Arabic—			
Karachi ...	English, ,, ,,	27*s.* 6*d.* to 35*s.*	27*s.* 6*d.* to 35*s.*
Madras ...	,, ,, ,,	27*s.* 6*d.* to 40*s.*	27*s.* 6*d.* to 40*s.*
Gum Kino ...	,, ,, lb.	9*d.* to 1*s.*	9*d.* to 1*s.*
Myrabolans—			
Bengal ...	,, ,, cwt.	3*s* 9*d.* to 4*s.* 3*d.*	3*s.* 9*d.* to 4*s.* 3*d.*
Bombay ...	,, ,, ,,	4*s* 6*d.* to 6*s.* 6*d.*	4*s.* 6*d.* to 6*s.* 9*a.*
Madras ...	,, ,, ,,	4*s.* 6*d.* to 5*s.*	4*s.* 6*d.* to 5*s.*
Myrabolans ...	Indian, per B. Md.	Rs. 2-4 to Rs. 2-9.	Rs. 2-5 to Rs. 2-8.
Nux Vomica—			
Bengal ...	English, per cwt.	7*s.* 6*d.* to 8*s.* 6*d.*	7*s.* 6*d.* to 8*s.*
Madras ...	,, ,, ,,	8*s.* to 9*s.*	7*s.* 6*d.* to 8*s.* 6*d.*
Cochin ...	,, ,, ,,	9*s* 6*d.* to 11*s.*	9*s.* 6*d.* to 11*s.*
Oil, Lemon Grass ...	,, ,, oz.	4¾*d.*	4¾*d.*
,, Rosha Grass ...	Indian, per seer	(Not quoted.)	Rs. 9-4 to Rs. 9-8.
,, Sandalwood ...	English, per lb.	11*s.* 6*d.*	11*s.* 3*d.* to 11*s.* 6*d.*
Rosin ...	,, ,, cwt.	16*s.* 6*d.* to 16*s.* 9*d.*	16*s.* 7½*d.* to 17*s.*
,, ...	Indian, ,, ,,	Rs. 16-8 to Rs. 17.	Rs. 16-8 to Rs. 17.
Turpentine ...	English, ,, ,,	34*s.* 9*d.* to 37*s.* 3*d.*	35*s.* to 36*s.* 3*d.*
Rubber, India—			
Assam ...	Indian, per B. Md.	Rs. 50 to Rs. 150.	Rs. 50 to Rs. 150.
,, ...	English, per lb.	4*s.* 3*d.*	3*s.* 6*d.* to 4*s.* 3*d.*
Burma ...	,, ,, ,,	2*s.* to 3*s.* 10*d.*	2*s.* to 2*s.* 8*d.*
Rubber, Para ...	,, ,, ,,	4*s.* 6¼*d.* to 4*s.* 7½*d.*	4*s.* 7*d.* to 5*s.* 1½*d.*
Seed-lac ...	,, ,, cwt.	52*s.* 6*d.* to 62*s.* 6*d.*	45*s.* to 60*s.*
Shellac, T.N. Diamond.	Indian, per B. Md.	Rs. 30 to Rs. 31-8.	Rs. 30 to Rs. 31-8.
,, T.N. Orange.	English, per cwt.	60*s.* to 63*s.* 6*d.*	61*s.* to 62*s.*
Tamarinds—			
Calcutta ...	,, ,, ,,	10*s.* to 12*s.*	10*s.* to 12*s.*
Madras ...	,, ,, ,,	4*s.* to 5*s.*	4*s.* to 5*s.*
Teak (Selected Indian, 1st class) ...	Indian, per ton of 50 c.ft.	Rs. 115 to Rs. 135.	Rs. 115 to Rs. 140.

Note.—(1) B. Md. indicates Bengal Maund, which is equal to 80 lbs.
(2) T. N. in Diamond and T. N. Orange are commercial terms applied to certain grades of shellac.

LIST OF BOOKS AND PUBLICATIONS RECEIVED BY THE HONORARY EDITOR DURING MARCH 1912.

The Indian Trade Journal for February 29th. March 7th, 14th and 21st.

The Indian Field for February 29th, March 7th, 14th.

Indian Engineering for March 2nd, 9th, 16th and 23rd.

India Rubber World for 1st February.

Institute International D'Agricutlure, Bulletin Bibliographique Hobdomadaire, Nos. 1, 2, 3 and 4.

American Forestry for February 1912.

Records of the Geological Survey of India, Vol. XLI, Pt. IV, 1912.

Revue des Eaux et Forets, Nos. 3, 4, and 5, 1912.

Agricultural Implements and Vehicles, Furniture and Cars Veneer, Bulletin No. 24, Department of Interior, Canada.

Monthly Weather Review for October 1911.

Bulletin of the Bureau of Agricultural Intelligence and of Plant-Diseases, No. 2, for February 1912, International Institute of Agriculture, Rome.

Department of the Interior, Canada, Bulletin No. 25, Lumber, Square Timber, Lathe and Shingles.

Indian and Eastern Engineer for March 1912.

Indian Law Reports, Madras Series, for January 1912.

Indian Weather Review, Annual Summary, 1910.

Agricultural Bulletin of the Straits and Federated Malay States for February 1912 (2 copies).

Proceedings of the Agri-Horticultural Society of Madras, October to December 1911.

Proceedings and Journal of the Agri-Horticultural Society of India for January to June 1911.

Annual Report of the Agricultural Stations in E.B. and Assam for 1911.

The Tropical Agriculturist for February 1912.

Denny, Mott and Dickson's Wood Market Report for March 1912.

Note on the Resin Value of Podophyllum Emodi and the best season for collecting it, by Puran Singh, Forest Bulletin No. 9.

A Note on some Germination Tests with Sal Seed (Shorea robusta) by R. S. Troup. Forest Bulletin No. 8.

Progress Report of Forest Administration in Baluchistan for 1910-11.

The Forest Flora of New South Wales, Vol. V, Pt. 6

Printed at the Pioneer Press, by GEO. SIM, No. 500.—23-5-12.

GAZETTE NOTIFICATIONS.

1.—Gazette of India.

18th April 1912.—No. 104—126-4-F.—Mr. H. H. Forteath, Deputy Conservator of Forests, Burma, is appointed to officiate as Conservator of Forests, 3rd grade, in Bihar and Orissa, with effect from the 3rd April 1912, in the post of the Conservator of Forests transferred from the old province of Eastern Bengal and Assam to the new province

19th April 1912.—No. 200—89-5-F.—Mr. M. C. C. Bonig, Extra Assistant Conservator of Forests, Andamans, is granted examination leave for three months under article 70 of the Forest Department Code, 6th edition, and privilege leave for three months in continuation thereof, with effect from the afternoon of 6th April 1912.

The services of Mr. A. R. Brown, Extra Assistant Conservator of Forests, on the Burma cadre, are placed at the disposal of the Superintendent of Port Blair for employment in the Andamans Forest Department *vice* Mr. Bonig.

2.—Madras Gazette.

4th April 1912.—*Leave.*—Under article 260 of the Civil Service Regulations, the Board grants privilege leave for one month to Mr. C. M. Hodgson, District Forest Officer, Anantapur, from or after the 5th May 1912.

Posting.—The Board orders the following posting :—

Mr. E. C. M. Mascarenhas, Extra Assistant Conservator of Forests, to do duty under the District Forest Officer, Anantapur, from the date of his return from leave.

9th April 1912.—No. 153.—With effect from 1st April 1912 the following postings of Forest Officers are ordered. :—

(1) Saiyid Burhanuddin Sahib Bahadur, Khan Sahib, Extra Deputy Conservator of Forests, *to be* District Forest Officer, Lower Godavari Division.

(2) Mr. Alfred Alyson Fennel Minchin, Assistant Conservator of Forests, doing duty under the District Forest Officer, West Kurnool Division, to act as District Forest Officer, Bellary, during the absence on leave of M. R. Ry. Rao Bahadur V. Alwar Chetti Garu or until further orders.

3.—Bombay Gazette.

26th March 1912.—No. 3001.—Mr. Chunilal Gulabchand Dalia, Extra Assistant Conservator of Forests and Divisional Forest Officer, North Nasik, is granted privilege leave of absence for two months with effect from 10th April 1912 or the subsequent date on which he may be relieved.

No. 3002.—His Excellency the Governor in Council is pleased to appoint Mr. G. R. Duxbury to hold charge of the office of Divisional Forest Officer, North Nasik, in addition to his own duties, during the absence on leave of Mr. Chunilal Gulabchand Dalia or pending further orders.

28th March 1912.—No. 3053.—Mr. A. C. Robinson, Extra Deputy Conservator of Forests and Divisional Forest Officer, South Thana, is granted privilege leave for three months in combination with furlough for nine months with effect from 1st June 1912, or the subsequent date on which he may be relieved.

2nd April 1912.—No. 3234.—Mr. G M. Ryan, Deputy Conservator of Forests, in charge Sind Circle, is granted privilege leave for three months in combination with furlough for one year and nine months with effect from 6th April 1912 or the subsequent date on which he may be relieved.

No. 3235.—His Excellency the Governor in Council is pleased to make the foollowing appointments :—

Mr. Balkrishna Janardhan Joshi to be an Extra Assistant Conservator of Forests *vice* Mr. Ganpat Jayavant Rege retiring, and to do duty in the Central Circle.

Mr. Sadashiv Pandurang Limaye to be Extra Assistant Conservator of Forests in the Southern Circle.

No. 3237.—His Excellency the Governor in Council is pleased to appoint the Honourable Mr. G. P. Millett to hold charge of the office of Divisional Forest Officer, Poona, in addition to his own duties, *vice* Mr. E. G. Oliver transferred, pending further orders.

No. 3268.—His Excellency the Governor in Council is pleased to make the following appointments : –

Mr. E. G. Oliver to act as Deputy Conservator of Forests in charge Sind Circle, *vice* Mr. G. M. Ryan proceeding on leave.

Mr. H. L. Newman to hold charge of the office of Deputy Conservator of Forests in charge Sind Circle, in addition to his own duties, from the date of departure of Mr. G. M. Ryan, pending the arrival of Mr. Oliver.

3rd April 1912.—No. 3313.—His Excellency the Governor in Council is pleased to make the following appointments :—

Mr. Nanabhai Dadabhai Sataravala, on return to duty, to be Divisional Forest Officer, Kolaba

Mr. Rustamji Hormasji Madan, on relief, to be Divisional Forest Officer, South Thana, *vice* Mr. A. C. Robinson proceeding on leave.

13th April 1912.—No. 3534.—Mr. Rustamji Hormasji Madan, Extra Deputy Conservator of Forests and Divisional Forest Officer, Kolaba, is granted privilege leave of absence for six weeks with effect from 20th April 1912 or the subsequent date on which he may be relieved.

16th April 1912.—No. 3640.—His Excellency the Governor in Council is pleased to appoint, with reference to Government Notification No. 3313, dated 3rd April 1912, Mr. A. C. Robinson to hold charge of the office of Divisional Forest Officer, Kolaba, in addition to his own duties, during the absence on privilege leave of Mr Rustamji Hormasji Madan or pending relief.

4—Bengal Gazette.

Nil.

5.—Assam Gazette.

10th April 1912.—No. 21R.—The services of the undermentioned officers are placed at the disposal of the Government of Bengal :—

Mr. T. H. Monteath, Deputy Conservator of Forests, on leave.

Mr. L. E. S. Teague, Deputy Conservator of Forests.

Mr. Gurudas Chatarji, Extra Assistant Conservator of Forests.

10th April 1910.—No. 24R.—Mr. A. J. W. Milroy, Assistant Conservator of Forests, is appointed to hold charge of the Cachar Forest Division.

Mr. Atulananda Das, Extra Assistant Conservator of Forests, Goalpara Forest Division, is attached to the Lakhimpur Forest Division.

Mr. Prabodh Chandra Chatarji, Extra Assistant Conservator of Forests, is attached to the Goalpara Forest Division.

Mr. L. J. Delanougerede, Probationary Extra Assistant Conservator of Forests, is attached to the Sibsagar Forest Division.

6.—United Provinces Gazette.

25th March 1912.—No. 1349—II/47.—Babu Birbal, Extra Assistant Conservator of Forests, leave on medical certificate for a period of six months, in continuation of the leave granted to him by notification No. 949—II/47, dated the 3rd March 1911.

7.—Punjab Gazette.

3rd April 1912.—*No.* 216.—*Notification.*—His Honour the Lieutenant-Governor is pleased to sanction with effect from the 1st April 1912 the formation of a new Forest Division to be known as "The Resin Division" with head-quarters at Lahore.

No. 217.—*Notification.*—Mr. R. Parnell, Deputy Conservator of Forests, attached to the Direction Division, on special duty, is posted to the charge of the Resin Division with effect from the 1st April 1912.

8.—Central Provinces Gazette.

28th March 1912.—No. 735.—Mr. J. Donald, Deputy Conservator of Forests, in charge of the South Chanda Forest Division, is transferred to the Melghat Forest Division (as Working Plans Officer).

No. 736.—Mr. C. E. C. Cox, Assistant Conservator of Forests, attached to the South Chanda Forest Division, is appointed to the charge of that Division.

No. 737.—Mr. A. Hunt, Extra Deputy Conservator of Forests, in charge of the Akola Forest Division, is transferred to the charge of the Seoni Forest Division.

No. 738.—Mr. B. Inamati Sham Rao, Extra Assistant Conservator of Forests, attached to the Akola Forest Division, is appointed to the charge of that Division.

9.—Burma Gazette,

1st April 1912.—No. 7.—With reference to Revenue (Forest) Department Notification No. 12, dated 7th February 1912, Mr. S. F. Hopwood, Deputy Conservator of Forests, on Working Plans duty in the Lower Chindwin Division relinquished charge of his duties on the forenoon of the 11th March 1912.

No. 8.—With reference to Revenue (Forest) Department Notification No. 24, dated the 15th March 1912, Mr. N. V. Holberton, Deputy Conservator of Forests, received charge of the Toungoo Forest Division from Mr. G. R. Long, Deputy Conservator of Forests, on the afternoon of the 26th March 1912.

Mr. G. R. Long availed himself of the leave granted him in Revenue (Forest) Department Notification No. 23, dated the 5th March 1912, on the afternoon of the same date.

3rd April 1912.—No. 38.—Mr. J. W. Bradley, Assistant Conservator of Forests, attached to the Upper Chindwin Forest Division, is transferred from Kindat and is posted to duty in the Katha Forest Division.

No. 30.—Mr. F. T. Dalton, Extra Assistant Conservator of Forests, attached to the Pegu Forest Division, is transferred from Pegu and is posted to duty in the Bassein-Myaung-mya Forest Division, in place of Mr. A. R. Brown, Extra Assistant Conservator of Forests, whose services have been placed at the disposal of the Superintenden of Port Blair for employment in the Andamans Forest Department.

11th April 1912.—No. 40.—Under the provisions of articles 233, 260 and 308 (*b*) of the Civil Service Regulations privilege leave to the extent due combined with furlough so as to make up a total period of eleven months is granted to Mr. F. A. Leete, Deputy Conservator of Forests, in charge of the Pyinmana Forest Division, with effect from the 25th April 1912 or the subsequent date on which he may avail himself of the privilege leave.

No. 41.—Mr. A. P. Davis, Assistant Conservator of Forests, attached to the Pyinmana Forest Division, is placed in charge of that Division as a temporary measure in place of Mr. F. A. Leete, Deputy Conservator of Forests, proceeding on leave.

21st March 1912.—No. 7.—With reference to Revenue (Forest) Department Notification No. 1, dated the 5th January 1912, Mr. H. H. Forteath, Deputy Conservator of Forests, assumed charge of the special duty in the Toungoo Forest Division, on the forenoon of the 25th January 1912.

Mr. Forteath reported his return from privilege leave at Jubbulpore on the afternoon of the 10th January 1912.

This Office Notification No. 4, dated the 9th February 1912, is cancelled.

TIMBER AND PRODUCE RATES.

C. LEARY & CO.'S LONDON MARKET REPORT.

1st to 30th March 1912.

EAST INDIA TEAK.—*Timber.*—The outstanding feature is the limited supplies available now and for the near future at the shipping ports, and although there are only moderate enquiries for forward delivery at the moment, there is apparently no possibility of supply exceeding the demand; there has been a fair spot demand for both Burma and Java. *Planks.* Even the small quantities of Burma and Siam wood offering are in excess of the demand; prices, however, are generally firm. Java is seldom asked for. Quotations are: Timber £14 to £25 (Java £7 to £20); Flitches £16 to £24 (Hewn Java £10 to £17); Planks £14 to £25 (Java £12 to £16); all per load on c.i.f. terms. The arrivals of Timber were 25 loads from Burma. The analysis of deliveries and stocks is as follows:—

	Deliveries for March. Loads.		Deliveries to 30th March. Loads.		Dock Stock. Loads.	
	Timber.	*Planks.*	*Timber.*	*Planks.*	*Timber.*	*Planks.*
1912 ...	1,003	356	1,552	1,089	3,151	3,644
1911 ...	386	317	893	873	1,696	3,213
1910 ...	160	343	1,046	726	1,579	2,739

PADOUK.—The small shipment which has just arrived is quite sufficient for the limited demand.

PENCIL CEDAR.—*Logs.*—The demand is restricted to clean timber of good dimensions, and values range from about 3*s.* upwards per foot cube, calliper measure.

SATINWOOD.—East India.—There is a fair enquiry, but further shipments are not desirable at the moment. Quotations in parcel are 6*d.* to 1*s.* 6*d.* for East India.

ROSEWOOD.—East India.—There is a fair business doing; we quote £7 to £15 per ton.

EBONY.—Ceylon.—Prime large logs can be advised. East India.—Limited supplies of sizeable timber of good quality would be well received. Quotations are:—Ceylon £7 to £15 per ton, East India £6 to £12.

MARKET RATES FOR FOREST PRODUCTS.

Name of Product.	Quotations, English or Indian.	Rates for March 1912.	Rates for April 1912.
Cardamoms ...	English, per lb.	2*s.* 3*d.* to 4*s.* 3*d.*	2*s.* 9*d.* to 4*s.* 3*d.*
Croton Seeds ...	,, ,, cwt.	70*s.* to 75*s.*	70*s.* to 75*s.*
Cutch ...	,, ,, ,,	28*s.* to 36*s.*	28*s.* to 36*s.*
,, (Tablets) ...	Burma ,, ,,	Rs. 47 to Rs. 48.	Rs. 45 to Rs. 47.
Gum Arabic—			
Karachi ...	English, ,, ,,	27*s.* 6*d.* to 35*s.*	27*s.* 6*d.* to 35*s.*
Madras ...	,, ,, ,,	27*s.* 6*d.* to 40*s.*	27*s.* 6*d.* to 35*s.*
Gum, Kino ...	,, ,, lb.	9*d.* to 1*s.*	6*d.* to 1*s.*
Myrabolans—			
Bengal ...	,, ,, cwt.	3*s.* 9*d.* to 4*s.* 3*d.*	3*s.* 9*d.* to 4*s.* 3*d.*
Bombay ...	,, ,, ,,	4*s.* 6*d.* to 6*s.* 9*d.*	4*s.* 6*d.* to 6*s.* 9*d.*
Madras ...	,, ,, ,,	4*s.* 6*d.* to 5*s.*	4*s.* 6*d.* to 5*s.*
Myrabolans ...	Indian, per B. Md.	Rs. 2-5 to Rs. 2-8.	Rs. 2-8.
Nux Vomica—			
Bengal ...	English, per cwt.	7*s.* 6*d.* to 8*s.* 6*d.*	7*s.* 6*d.* to 8*s.*
Madras ...	,, ,, ,,	7*s.* 6*d.* to 8*s.* 6*d.*	7*s.* 6*d.* to 8*s.* 6*d.*
Cochin ...	,, ,, ,,	9*s.* 6*d.* to 11*s.*	9*s.* 6*d.* to 12*s.* 6*d.*
Oil, Lemon Grass ...	,, ,, oz.	4¾*d.*	4¾*d.*
,, Rosha Grass ...	Indian, per seer	Rs. 9-4 to Rs. 9-8.	(Not quoted).
,, Sandalwood ...	English, per lb.	11*s.* 3*d.* to 11*s.* 6*d.*	11*s.* 6*d.*
Rosin ...	,, ,, cwt.	16*s.* 7½*d.* to 17*s.*	16*s.* 9*d.* to 17*s.* 3*d.*
,, ...	Indian ,, ,,	Rs. 16-8 to Rs. 17.	Rs. 16-8 to Rs. 17.
Turpentine ...	English ,, ,,	35*s.* to 36*s.* 3*d.*	35*s.* 6*d.* to 36*s.* 6*d.*
Rubber, India—			
Assam ...	Indian, per B. Md.	Rs. 50 to Rs. 150.	Rs. 70 to Rs. 185.
,, ...	English, ,, lb.	3*s.* 6*d.* to 4*s.* 3*d.*	3*s.* 6*d.* to 4*s.* 3*d.*
Burma ...	,, ,, ,,	2*s.* to 2*s.* 8*d.*	2*s.* to 2*s.* 8*d.*
Rubber, Para ...	,, ,, ,,	4*s.* 7*d.* to 5*s.* 1½*d.*	4*s.* 9*d.* to 4*s.* 10*d.*
Seed-lac ...	,, ,, cwt.	45*s.* to 60*s.*	45*s.* to 60*s.*
Shellac, T. N. Diamond	Indian, per B. Md.	Rs. 30 to Rs. 31-8.	Rs. 32 to Rs. 34.
,, T. N. Orange	English, ,, cwt.	61*s.* to 62*s.*	62*s.* to 64*s.*
Tamarinds—			
Calcutta ...	,, ,, ,,	10*s.* to 12*s.*	10*s.* to 12*s.*
Madras ...	,, ,, ,,	4*s.* to 5*s.*	4*s.* to 5*s.*
Teak (Selected Indian, 1st class).	Indian, per ton of 50 c.ft.	Rs. 115 to Rs. 140.	Rs. 115 to Rs. 140.

Note.—(1) B. Md. indicates Bengal Maund, which is equal to 80 lbs.

(2) T. N. in Diamond and T. N. Orange are commercial terms applied to certain grades of shellac.

LIST OF BOOKS AND PUBLICATIONS RECEIVED BY THE HONORARY EDITOR DURING APRIL 1912.

The Indian Field for March 21st and 28th and April 4th, 11th, 18th.

The Indian Trade Journal for March 28th, April 4th, 11th, 18th.

Indian Industries and Power for March 1912.

India Rubber World for 1st Mareh 1912.

Indian Engineering for 30th March and April 6th, 13th, 20th.

Revue des Eaux et Forets Nos. 6 and 7.

American Forestry for March 1912.

Experiment Station Record, Vol. XXV, No. 9, and Vol. XXVI, No. 1, United States Department of Agriculture, Washington.

Report on the Forest Administration of the Central Provinces for 1910-11 (two copies).

The Scottish Geographical Magazine for March 1912.

Memoirs of the Department of Agriculture in India, The "Rab" System of Rice Cultivation in Western India, Vol. II, No. 3, 1912.

Canadian Forestry Journal for January-February 1912.

Commercial America for March 1912.

Logging and Lumbering or Forest Utilization by C. A. Schenck.

Bulletin Bibliographique Hebdomadaire Nos. 7 and 1 for February 1912.

Bulletin Economique de L' Indochine No. 94.

Agricultural Bulletin of the Straits and Federated Malay States for March 1912 (two copies).

Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases for March 1912.

Report on the Progress of Agriculture in India for 1910-11.

The Indian and Eastern Engineer for April 1912.

Report of the Superintendent of Forestry, 1911, Department of the Interior, Dominion of Canada.

Annual Administration Report of the Forest Department of the Madras Presidency for the twelve months ending 30th June 1911.

Administration Report of the Forest Circles in the Bombay Presidency including Sind, 1910-11.

Memoirs of the Department of Agriculture in India, The Influence of Red Colour and the regularity of self-fertilisation in Corchourus Capsularis, Linn., the common Jute plant.

Memoirs of the Department of Agriculture in India.

Observations on certain extra-Indian Asiatic Cottons, Vol. IV, Nos. 4 and 5 respectively.

Indian Forest Records, Note on the Antiseptic Treatment of Timber in India with special reference to Railway Sleepers by R. S. Pearson, Vol. III, Pt. II.

Annual Progress Report on Forest Administration in the Lower Provinces of Bengal for 1910 11.

Printed at the Pioneer Press, by GEO. SIM, No. 641—12-6-12.

GAZETTE NOTIFICATIONS.

1.—Gazette of India.

25th April 1912.—No. 289—143-2.—Rai Keshavanand Bahadur, Extra Deputy Conservator of Forests and Assistant Instructor at the Forest Research Institute and College, Dehra Dun, is granted privilege leave for one month and 15 days, with effect from the 1st April 1912 or the subsequent date on which he may avail himself of it.

22nd May 1912.—No. 322—89-9-F.—The three months' examination leave granted to Mr. M. C C. Bonig, Extra Assistant Conservator of Forests, Andamans, with effect from the afternoon of the 6th April 1912, in the Notification of this Department No. 200-F., dated the 19th April 1912, is cancelled.

From the same date Mr. Bonig's services are placed at the disposal of the Government of Burma for special duty for a period of about three months.

On the expiry of the above period, Mr. Bonig is granted privilege leave for three months.

The services of Mr. A. R. Brown, Extra Assistant Conservator of Forests on the Burma cadre, are, as already notified, placed at the disposal of the Superintendent of Port Blair for employment in the Andamans Forest Department, *vice* Mr. Bonig.

26th April 1912.—No. 227.—Mr. A. R. Brown, Extra Assistant Conservator of Forests, Andamans, is appointed to be an Assistant Superintendent in the Settlement so long as he holds his present office or until further orders.

2.—Madras Gazette.

17th April 1912.—No. 170.—The following postings of Forest Officers are ordered :—

(1) Mr. Frederick Adolphus Seager, District Forest Officer, Kistna, *to be* District Forest Officer, Lower Godavari Division.

(2) Mr. Henry Joshua McLaughlin, Extra Assistant Conservator of Forests, *to be* District Forest Officer, Kistna.

[*Note.*—These postings supersede that contained in Notification No. 153 (1) published on page 394 of Part I of the *Fort St. George Gazette*, dated 9th April 1912.]

19th April 1912.—(1) Mr. Francis Cowley Loftus Cowley-Brown, District Forest Officer, North Salem Division, to be Principal of the Madras Forest College, Coimbatore.

(2) M.R. Ry. V. Subramania Aiyar Avargal, District Forest Officer, Nellore, to be Assistant Instructor, the Madras Forest College, Coimbatore.

20th April 1912.—No. 167.—Under articles 260, 233 and 338 of the Civil Service Regulations, Khan Sahib Saiyid Burhanuddin Sahib Bahadur, Extra Deputy Conservator of Forests, is granted furlough for three months in continuation of the privilege leave for three months already granted to him.

14th May 1912.—No. 210.—The following postings of Forest Officers are ordered :—

(1) M. R Ry. K. R. Venkataramana Aiyar Avargal, District Forest Officer, South Arcot, *to be* Assistant Instructor, the Madras Forest College, Coimbatore.

(2) Mr. Denis Thurburn Barry, Deputy Conservator of Forests, on return from leave, *to be* District Forest Officer, South Canara.

(3) Mr. Thomas Clear, Acting District Forest Officer, South Canara, *to be* District Forest Officer, North Salem.

18th May 1912.—No. 208.—Under article 260 of the Civil Service Regulations, Mr. J. Tapp, Extra Assistant Conservator of Forests, is granted privilege leave for three months with effect from the date of relief.

3.—Bombay Gazette.

23rd April 1912.—No. 251.—Messrs. C. G. Dalia, Extra Assistant Conservator of Forests, and G. R. Duxbury, Deputy Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, North Nasik, on the afternoon of the 10th April 1912.

27*th April* 1912.—No. 311.—Mr. E. G. Oliver, Deputy Conservator of Forests, and the Honourable Mr. G. P. Millett, Conservator of Forests, C. C., respectively delivered over and received charge of the Divisional and Sub-Divisional Forest Offices, Poona, on the afternoon of the 10th April 1912.

29*th April* 1912.—No. 626.—Mr. Sadashiv Pandurang Limaye, Extra Assistant Conservator of Forests, posted to the Southern Circle in Government Notification No. 3235, dated 2nd April 1912, received charge of his duties as Sub-Divisional Forest Officer, Kanara Southern Division, from Mr. G. S. Butterworth, Divisional Forest Officer, Kanara Southern Division, on the 23rd instant, forenoon.

30*th April* 1912.—No. 380.—Messrs. S. P. Limaye, Extra Assistant Conservator of Forests, and B. J. Joshi, on appointment to the rank of Extra Assistant Conservator, respectively delivered over and received charge of the Sub-Divisional Forest Office, North Khandesh, on the forenoon of the 9th April 1912.

1*st May* 1912.—No. 286.—Mr. R. H. Madan, Extra Deputy Conservator of Forests, delivered over and Mr. A. C. Robinson, Extra Deputy Conservator of Forests, received charge of the office of the Divisional Forest Officer, Kolaba, on the 19th day of April 1912, in the afternoon.

14*th May* 1912.—No. 4625.—In modification of so much of Government Notification No. 3313, dated 3rd April 1912, as relates to Mr. Nanabhai Dadabhai Sataravala, His Excellency the Governor in Council is pleased to make the following appointments :—

Mr. V. D. P. Rebeiro to be Divisional Forest Officer, Kolaba.

Mr. Nanabhai Dadabhai Sataravala, on return to duty, to be Divisional Forest Officer, Dharwar.

21*st May* 1912.—No. 4810.—In supersession of so much of Government Notification No. 3313, dated 3rd April 1912, as relates to Mr. Rustamji Hormusji Madan, His Excellency the Governor in Council is pleased to appoint Mr. Ardeshar Nasarvanji Master to be Divisional Forest Officer, South Thana, *vice* Mr. A. C. Robinson, proceeding on leave.

No. 4815.—His Excellency the Governor in Council is pleased to appoint Mr. Sadashiv Pandurang Limaye to act as Divisional Forest Officer, Bijapur, *vice* Mr. Ardeshar Nasarvanji Master, pending further orders.

No. 4816.—His Excellency the Governor in Council is pleased to appoint Mr. D. A. Thomson, on return to duty, to be Divisional Forest Officer, Poona.

4.—Bengal Gazette.

23*rd April* 1912.—*No.* 8 *Forests.*—Mr. L. E. S. Teague, Deputy Conservator of Forests, on transfer from Assam, is placed in charge of the Jalpaiguri Forest Division with effect from the 5th April 1912.

30*th April* 1912.—*No.* 9 *Forests.*—Babu Gurudas Chatarji, Extra Assistant Conservator of Forests, on transfer from Assam, is posted to the charge of the Buxa Range in the Buxa Forest Division, with effect from the afternoon of the 20th April 1912.

5.—Assam Gazette.

16*th May* 1912.—No. 388R.—Mr. W. R. LeG. Jacob, Deputy Conservator of Forests, is allowed privilege leave for two months and 24 days, under article 260 of the Civil Service Regulations, combined with furlough for one year, two months and six days under articles 233 and 308 (*b*) of the same Regulations, with effect from the 15th May 1912, or the subsequent date on which he may avail himself of it.

30*th April* 1912.—No. 214R.—Mr. Ramnath Mukharji, Extra Assistant Conservator of Forests, on the completion of the Provincial Forest Training Class Course for 1911-12, is attached to the Goalpara Forest Division.

1*st May* 1912.—No. 223R.—The services of Mr. H. Carter, Conservator of Forests, 3rd grade, on leave, are placed at the disposal of the Government of Bihar and Orissa.

1*st May* 1912.—No. 225R.—Mr. H. Carter, Conservator of Forests, Eastern Circle, Eastern Bengal and Assam, was allowed by the Government of Eastern Bengal and Assam, privilege leave for 3 months under article 260 of the Civil Service Regulations, combined with furlough for 4 months under articles 308 (*b*) and 233 of the same regulations, with effect from the afternoon of the 28th March 1912.

6.—Bihar and Orissa Gazette.

29th April 1912.—No 85R (B).—The undermentioned notification issued by the Government of India in the Revenue and Agriculture Department, is republished for general information :—

No. 194F—126-4.—Simla, the 18th April 1912.—Mr. H. H Forteath, Deputy Conservator of Forests, Burma, is appointed to officiate as Conservator of Forests, 3rd grade, in Bihar and Orissa, with effect from the 3rd April 1912, in the post of the Conservator of Forests, transferred from the old province of Eastern Bengal and Assam to the new province.

17th May 1912.—No. 301R B).—Mr. A. P. Mudaliar, Extra Assistant Conservator, Singhbhum, is transferred to Sambalpur and is appointed to take charge of the Sambalpur Forest Division, *vice* Mr. E. R. Comber.

17th May 1912 —No. 302R(B).—Mr. E. R. Comber, Extra Assistant Conservator, Sambalpur, is transferred to Angul and is appointed to take charge of the Angul Division, *vice* Mr. A H. Mee.

17th May 1912.—No. 303R(B).—Mr. A. H. Mee, Extra Deputy Conservator, Angul, is placed on foreign service for employment in the Mayurbhanj Feudatory State.

7.—United Provinces Gazette.

Transfers.

8th May 1912.—No. 1.—Mr. C. B. Patterson, Assistant Conservator of Forests, from Siwalik Forest Division, to Chakrata Forest Division, as an attached officer.

No. 2.—Mr. R. G. Marriott, Assistant Conservator of Forests, from Haldwani Forest Division of the Eastern Circle, to Naini Tal Forest Division of the Western Circle, as an attached officer.

No. 3.—Mr. M. W. Clifford, Assistant Conservator of Forests, from Kheri Forest Division of the Eastern Circle, to Naini Tal Forest Division of the Western Circle, as an attached officer.

8th May 1912.—No. 4.—Mr. H. C. Ross, Extra Assistant Conservator of Forests, attached to the Haldwani Forest Division of the Eastern Circle, privilege leave for two months, with effect from the 15th May 1912, or subsequent date.

8.—Punjab Gazette.

25th April 1912.—No. 261.—*Notification.*—Mr. B. O. Coventry, Deputy Conservator of Forests, and Mr. R. N. Parker, Deputy Conservator of Forests, respectively made over and received charge of the Direction Division and of the duties of Personal Assistant to the Conservator of Forests, Punjab, on the forenoon of 9th April 1912.

From the same date Mr. Coventry is transferred to the Bashahr Division.

4th May 1912 —No. 270. *Notification.*—On return from privilege leave granted him in Punjab Government Notification No. 39, dated 15th January 1912, Mr. H. M. Glover, Assistant Conservator of Forests, was posted to the Direction Division, where he reported himself for duty on the afternoon of the 30th March 1912. From the same date he was attached to the Division.

8th May 1912.—No. 276.—*Notification.*—Mr. M. R K Jerram, Deputy Conservator of Forests, and Mr. H. M. Glover, Assistant Conservator of Forests, respectively made over and received charge of the Rawalpindi Division on the afternoon of the 18th April 1912, on which date Mr. Jerram proceeded on 6 months' combined leave.

9th May 1912.—No. 293.—*Notification.*—Consequent on his transfer to the Rawalpindi Division, Mr. H. M. Glover, Assistant Conservator of Forests, was relieved of his duties in the Direction Division on the afternoon of the 7th April 1912. He reported his arrival in the Rawalpindi Division on the forenoon of the 8th April 1912, from which date he is attached to the Division.

No. 296.—*Notification.*—Mr. L. B. Holland, Assistant Conservator of Forests, and Mr. B. O. Coventry, Deputy Conservator of Forests, respectively made over and received charge of the Bashahr Forest Division on the afternoon of the 10th April 1912. From the same date Mr. L. B. Holland remains attached to the Division.

9.—CENTRAL PROVINCES GAZETTE.

29th April 1912.—No. 2.—Privilege leave for three months, under article 260 of the Civil Service Regulations, is hereby granted to Mr. G. P. Misra, Extra Assistant Conservator of Forests, attached to the Raipur Forest Division, with effect from the 15th April 1912, or the subsequent date on which he may be permitted to avail himself of it.

4th May 1912.—No. 959.—Privilege leave for three months, in combination with special leave on urgent private affairs for three months, under articles 233 (ii), 260 and 316 of the Civil Service Regulations, is granted to Mr. G. M. Townshend, Deputy Conservator of Forests, in charge of the Nagpur-Wardha Division, with effect from the 27th April 1912.

No. 960.—Rao Bahadur S. Shrinivasulu Nayadu, Extra Deputy Conservator of Forests, in charge of the Buldana Forest Division, is transferred to the charge of th Nagpur-Wardha Forest Division.

No. 961.—Mr. Pandurang Narayan, Extra Assistant Conservator of Forests, attached to the Buldana Forest Division, is placed in charge of that Division.

23rd May 1912.—No. 5.—On relief by Mr A. Hunt, Extra Deputy Conservator of Forests, of the charge of the Seoni Forest Division, Mr. C. V. Sarvate, Extra Assistant Conservator of Forests, is transferred to the Chhindwara Division as an attached officer.

10.—BURMA GAZETTE.

27th March 1912.—No. 5.—With reference to Revenue (Forest) Department Notification No. 25, dated the 5th March 1912, Mr. N. V. Holberton, Deputy Conservator of Forests, made over, and Mr. W. R. French, Extra Assistant Conservator of Forests, received charge, as a temporary measure, of the Minbu Forest Division, on the afternoon of the 19th March 1912, in addition to his other duties.

29th March 1912.—No. 6.—With reference to Revenue (Forest) Department Notification No. 12, dated the 7th February 1912, Mr. S. F. Hopwood, Deputy Conservator of Forests, assumed charge of the working-plans duty in the Yaw Forest Division on the forenoon of 11th March 1912.

12th April 1912.—No. 7.—Mr. W. S. Powell, Assistant Conservator of Forests, relinquished charge of his duties, as Girdling Officer, in the Yaw Division, to which he was posted in Revenue (Forest) Department Notification No. 219, dated the 23rd November 1911, on the afternoon of 8th April 1912.

No. 4.—With reference to Revenue (Forest) Department Notification No. 39, dated the 3rd April 1912, Mr. F. T. Dalton, Extra Assistant Conservator of Forests, relinquished charge of his duties in the Pegu Forest Division, on the afternoon of the 2nd April 1912.

17th April 1912.—No. 8.—Mr. W. R. French, Extra Assistant Conservator of Forests, made over, and Mr. W. S. Powell, Assistant Conservator of Forests, received charge, of the Minbu Forest Division, on the forenoon of the 12th April 1912.

18th April 1912.—No. 41.—On return from leave, Mr. A. H. M. Lawson, Deputy Conservator of Forests, is attached to the Ataran Forest Division.

24th April 1912.—No. 6.—With reference to Revenue (Forest Department) Notification No. 5, dated the 18th January 1912, Mr. A. W. Moodie, Assistant Conservator of Forests, assumed charge of his duties in the Zigon Forest Division, on the forenoon of the 19th January 1912.

24th April 1912.—No. 48.—On return from leave Mr. Hatim Tai, A. T. M., Extra Assistant Conservator of Forests, is posted to duty in the Pegu Forest Division.

25th April 1912.—No. 49.—Under the provisions of Article 336 of the Civil Service Regulations, Mr. F. A. Reich, Extra Assistant Conservator of Forests, on duty in the West Salween Forest Division, is granted leave on medical certificate for three months, with effect from the 18th April 1912.

No. 50.—On completion of the girdling duty in the Yaw Forest Division, Mr. W. S. Powell, Assistant Conservator of Forests, was posted to the charge of the Minbu Forest Division, in place of Mr. W. R. French, Extra Assistant Conservator of Forests, transferred.

No. 51.—On relief by Mr. W. S. Powell, Assistant Conservator of Forests, Mr. W. R. French, Extra Assistant Conservator of Forests, was transferred from Minbu and reposted to the charge of the Magwe Forest Subdivision, Minbu Forest Division.

27th April 1912.—No. 9.—With reference to Revenue (Forest) Department Notification No. 41, dated the 11th April 1912, Mr. F. A. Leete, Deputy Conservator of Forests,

made over, and Mr. A. P. Davis, Assistant Conservator of Forests, received charge of the Pyinmana Forest Division, as a temporary measure, on the afternoon of the 25th April 1912.

30*th April* 1912.—No. 52.—Under the provisions of Articles 233, 260 and 308 (*b*) of the Civil Service Regulations, privilege leave for three months combined with furlough for one year and nine months is granted to Mr G. F. R. B. Thurling, Deputy Conservator of Forests, in charge of the Ataran Forest Division, with effect from the 12th May 1912, or the subsequent date on which he may avail himself of the privilege leave.

6*th May* 1912.—No. 57.—Under the provisions of Articles 260, 233 and 316 of the Civil Service Regulations, privilege leave for three months and special leave on urgent private affairs for three months in continuation thereof is granted to Mr. C. G. E. Dawkins, Assistant Conservator of Forests, in charge of the Gangaw Forest Subdivision, Yaw Forest Division, with effect from the 25th May 1912, or the subsequent date on which he may avail himself of the privilege leave.

8*th May* 1912.—No. 7.—With reference to Revenue (Forest) Department Notification No 39, dated the 3rd April 1912, Mr F. T. Dalton, Extra Assistant Conservator of Forests, reported his arrival at Bassein on the forenoon of the 7th April, and assumed charge of the Wakema Range on the afternoon of the 15th April 1912

From the 7th to 13th April, Mr. Dalton was attached to the office of the Deputy Conservator of Forests, Bassein-Myaungmya Division.

9*th May* 1912.—No. 8.—With reference to Revenue (Forest) Department Notification No. 48, dated the 24th April 1912, Mr. Hatim Tai, A. T. M., Extra Assistant Conservator of Forests, assumed charge of his duties in the Pegu Forest Division on the forenoon of the 3rd May 1912.

No. 10.—With reference to Revenue (Forest) Department Notification No. 44, dated the 18th April 1912, Mr. A M. H. Lawson, Deputy Conservator of Forests, assumed charge of his duties in the Ataran Forest Division on the 19th April 1912, afternoon.

13*th May* 1912.—No 8.—With reference to Revenue (Forest) Department Notification No. 38, dated the 3rd April 1912, Mr. J. W. Bradley, Assistant Conservator of Forests, was relieved of his duties in the Upper Chindwin Division on the afternoon of the 27th April 1912, and assumed charge of his duties in the Katha Division on the forenoon of the 4th May 1912.

14*th May* 1912.—No. 11.—With reference to Government of India Revenue and Agricultural Department Notification No. 194—126-4-F., dated Simla, the 18th April 1912, Mr. H. H. Forteath, Deputy Conservator of Forests, relinquished charge of the special duty in the Toungoo Forest Division, on the afternoon of the 9th March 1912.

15*th May* 1912.—No. 59.—Mr. A H M. Lawson, Deputy Conservator of Forests, attached to the Ataran Forest Division, is placed in charge of that division in place of Mr. G. F. R. B. Thurling, Deputy Conservator of Forests, proceeding on leave.

16*th May* 1912. No. 60.—Mr. C. R. Dun, Deputy Conservator of Forests, has been granted by His Majesty's Secretary of State for India an extension of furlough for nine days in continuation of the combined leave granted to him in this department Notification No. 190, dated the 27th October 1911, as amended by this department Notification No. 220, dated the 25th November 1911.

No. 61.—Mr. A. B. Nixon, Assistant Conservator of Forests, has been granted by His Majesty's Secretary of State for India an extension of furlough for five months on medical certificate in continuation of the leave granted to him in this department Notification No. 26, dated the 7th March 1912.

No. 62.—Mr G. K. Parker, Deputy Conservator of Forests, in charge of the Thayetmyo Forest Division, is transferred from Thayetmyo and is posted to the charge of the Prome Forest Division in place of Mr. G. R. Jeffery, Deputy Conservator of Forests, transferred.

No. 63.—Mr. G. R. Jeffery, Deputy Conservator of Forests, in charge of the Prome Forest Division, is transferred from Prome and is posted to the charge of the Thayetmyo Forest Division in place of Mr. G. K. Parker, Deputy Conservator of Forests, transferred.

No. 64.—Under the provisions of Articles 260, 233 and 316 of the Civil Service Regulations, privilege leave for three months and special leave on urgent private affairs for three months in continuation thereof is granted to Mr. H. W. A. Watson, Deputy Conservator of Forests, in charge of the Ruby Mines Forest Division, with effect from the 1st June 1912 or the subsequent date on which he may avail himself of the privilege leave.

No. 65.—Mr. J. V. Young, Assistant Conservator of Forests, attached to the Pyinmana Forest Division, is transferred from Pyinmana and is posted to the charge of the Ruby Mines Forest Division in place of Mr. H. W. A. Watson, Deputy Conservator of Forests, proceeding on leave.

No. 66.—Pending the arrival of Mr. J. V. Young, Assistant Conservator of Forests, posted to the charge of the Ruby Mines Forest Division in Revenue (Forest) Department Notification No. 65, dated the 16th May 1912, Mr. D. H. M. Silvanus, Assistant Conservator of Forests, attached to the Ruby Mines Forest Division, is placed temporarily in charge of that division in place of Mr. H. W. A. Watson, Deputy Conservator of Forests, proceeding on leave.

17*th May* 1912.—No. 10.—In this circle Notification No. 9, dated the 27th April 1912, *delete* the words "as a temporary measure"

21*st May* 1912.—No. 69.—Mr. T. I. Pocock, Extra Deputy Conservator of Forests, prior to his assumption of charge of the Myittha Forest Division to which he was posted in this department Notification No. 212, dated the 10th November 1911, was placed on special duty at the headquarters of the Myittha Forest Division on the 12th November 1911.

No. 70.—Under the provisions of Articles 260, 233 and 308 (*b*) of the Civil Service Regulations, privilege leave for three months combined with furlough for three months is granted to Mr. E. S. Carr, Conservator of Forests, Tenasserim Circle, with effect from the date on which he is relieved of his duties by Mr G. R. Long, Deputy Conservator of Forests, on return from leave.

No 71.—On return from leave, Mr. G R. Long, Deputy Conservator of Forests, who has been appointed to officiate as a Conservator, is posted to the charge of the Tenasserim Forest Circle in place of Mr. E S. Carr, Conservator of Forests, proceeding on leave.

21*st May* 1912.—No. 12.—With reference to Revenue (Forest) Department Notification No. 59, dated the 15th May 1912, Mr. A. H. M. Lawson, Deputy Conservator of Forests, received charge of the Ataran Forest Division from Mr. G. F. R. B. Thurling, Deputy Conservator of Forests, on the afternoon of the 11th May 1912.

From the same date Mr. G. F. R. B. Thurling availed himself of the leave granted him in Revenue (Forest) Department Notification No. 52, dated the 30th April 1912.

TIMBER AND PRODUCE RATES.

C. LEARY & CO.'S LONDON MARKET REPORT.

1*st to* 30*th April* 1912.

EAST INDIA TEAK.—*Timber.*—Prices for all descriptions continue very firm, despite a limited enquiry, and the tendency is all upwards, as there is no prospect of any early increase in the supplies available at the shipping ports. *Planks.*—The enquiry for Burma and Siam has not been heavy, but owing to the serious shortage of supplies in the East values have advanced materially and still have an upward tendency. Java is also in only limited request, and but few sales are possible at current quotations. Quotations are: Timber £14 to £25 (Java £7 to £20); Flitches £16 to £24 (Hewn Java £10 to £17); Planks £14 to £25 Java £12 to £16); all per load on c.i.f. terms. The arrivals of Timber were 150 loads from Burma, 50 loads from Bangkok, and 25 loads from Java. The analysis of deliveries and stocks is as follows:—

	Deliveries for April. Loads.		Deliveries to 30th April. Loads.		Dock Stock. Loads.	
	Timber.	*Planks.*	*Timber.*	*Planks.*	*Timber.*	*Planks.*
1912 ...	188	177	1,740	1,266	3,018	4,026
1911 ...	255	188	1,148	1,061	2,080	3,258
1910 ...	435	523	1,481	1,249	1,631	3,205

PADOUK.—There is but little enquiry; the shipment referred to in our last report was offered in auction, but no bids were forthcoming.

PENCIL CEDAR.—*Logs.*—The requirements of the market are still for large wood of good sizes; values range from about 3s. upwards per foot cube, calliper measure.

SATINWOOD.—East India.—The tone is dull; there is a considerable stock, principally of low-class wood; prime, sizeable parcels would do well. Quotations in parcel are per foot super 4½d. to 1s. 6d.

ROSEWOOD.—East India.—Parcels of good size and character would realise full rates; we quote £7 to £15 per ton.

EBONY.—Ceylon.—Fair rates would be paid for large timber of good quality. East India.—Prime, sizeable logs can be advised. Quotations are:—Ceylon £7 to £15 per ton and East India £6 to £12.

MARKET RATES FOR FOREST PRODUCTS.

Name of Product.	Quotations, English or Indian.	Rates for April 1912.	Rates for May 1912.
Cardamoms ...	English, per lb.	2s. 9d. to 4s. 3d.	2s. 9d. to 4s. 6d.
Croton Seeds ...	,, ,, cwt.	70s. to 75s.	70s. to 75s.
Cutch ...	,, ,, ,,	28s. to 36s.	29s. to 37s. 6d.
,, (Tablets) ...	Burma, ,, ,,	Rs. 45 to Rs. 47.	Rs. 45 to Rs. 50.
Gum Arabic—			
Karachi ...	English, ,, ,,	27s. 6d. to 35s.	27s. 6d. to 35s.
Madras ...	,, ,, ,,	27s. 6d. to 35s.	27s. 6d. to 35s.
Gum, Kino ...	,, ,, lb.	6d. to 1s.	6d. to 1s.
Myrabolans—			
Bengal ...	,, ,, cwt.	3s. 9d. to 4s. 3d.	3s. 9d. to 4s. 3d.
Bombay ...	,, ,, ,,	4s. 6d. to 6s. 9d.	4s. 6d. to 6s. 9d.
Madras ...	,, ,, ,,	4s. 6d. to 5s.	4s. 6d. to 5s.
Myrabolans ...	Indian, per B. Md.	Rs. 2-4 to Rs. 2-8.	Rs. 2-6 to Rs. 2-8.
Nux Vomica—			
Bengal ...	English, per cwt.	7s. 6d. to 8s.	7s. 6d.
Madras ...	,, ,, ,,	7s. 6d. to 8s. 6d.	7s. 6d. to 8s. 6d.
Cochin ...	,, ,, ,,	9s. 6d. to 12s. 6d.	9s. 6d. to 12s. 6d.
Oil, Lemon Grass ...	,, ,, oz.	4¾d.	4¾d. to 5d.
,, Rosha Grass ...	Indian, per seer	(Not quoted).	Rs. 10-2 to Rs. 11-4.
,, Sandalwood ...	English, per lb.	11s. 6d.	11s. 6d.
Rosin ...	,, ,, cwt.	16s. 9d. to 17s. 3d.	16s. 3d. to 16s. 6d.
,, ...	Indian ,, ,,	Rs. 16-8 to Rs. 17.	Rs. 16-8 to Rs. 17.
Turpentine ...	English ,, ,,	35s. 6d. to 36s. 6d.	34s. 6d. to 38s.
Rubber, India—			
Assam ...	Indian, per B. Md.	Rs. 70 to Rs. 185.	Rs. 70 to Rs. 195.
,, ...	English, ,, lb.	3s. 6d. to 4s. 3d.	3s. 8d. to 4s. 2d.
Burma ...	,, ,, ,,	2s. to 2s. 8d.	2s. to 2s. 9d.
Rubber, Para ...	,, ,, ,,	4s. 9d. to 4s. 10d.	4s. 5½d. to 4s. 8d.
Seed-lac ...	,, ,, cwt.	45s. to 60s.	45s. to 60s.
Shellac, T. N. Diamond	Indian, per B. Md.	Rs. 32 to Rs. 34.	Rs. 31 to Rs. 32.
,, T. N. Orange	English, ,, cwt.	62s. to 64s.	63s. to 64s.
Tamarinds—			
Calcutta ..	,, ,, ,,	10s. to 12s.	9s. to 10s.
Madras ...	,, ,, ,,	4s. to 5s.	4s. to 5s.
Teak (Selected Indian, 1st class).	Indian, per ton of 50 c.ft.	Rs. 115 to Rs. 140.	Rs. 115 to Rs. 135.

Note.—(1) B. Md. indicates Bengal Maund, which is equal to 80 lbs.
(2) T. N. in Diamond and T. N. Orange are commercial terms applied to certain grades of shellac.

LIST OF BOOKS AND PUBLICATIONS RECEIVED BY HONORARY EDITOR DURING MAY 1912.

India Rubber World for April and May 1912.

Forestry Quarterly, Vol. No. 1 for March 1912.

Agricultural Ledger 1911, No. 4, Cinchona Bark (Two copies).

Bulletin Bibliographique Hebdomadaire Nos. 9, 10, 11 and 12, March 1912.

Indian Trade Journal for May 2nd, 9th, 16th and 23rd.

Annual Report on the Forest Administration in Ajmer-Merwara for 1910-11.

Tropical Agriculturist for April 1912.

Official Register of Harvard University, Vol. IX, No. 11, April 1912.

Report on an Investigation into the Current Annual Increment in Girth, at 5 ft. above ground, of a Douglas Fir Plantation, 32 years of age, in the Quarries Wood on the Benmore Estate, Kilmun, Cowal District of Argyllsture, during the year 1911, Bulletin No. 59 of West of Scotland Agricultural College, Glasgow.

Indian Engineering for May 4th, 11th, 18th and 25th.

Revue des Eaux et Forets Nos. 8 and 9, 1912.

United States Department of Agriculture, Experiment Station Record, Vol. XXVI, No. 2 for February 1912.

Report on the Revenue Administration of the Central Provinces for 1910-11.

Indian Field for April 25th and May 2nd, 16th and 23rd.

Canadian Forestry Journal for March-April 1912.

University of California Publications :—

California Plant Diseases, Bulletin No. 218; Report of Live-stock conditions in Imperial County, California, Bulletin No. 219; Dosage Tables, Bulletin No. 220; The Red or Orange Scale, Bulletin No. 222 and The Black Scale, Bulletin No. 223.

International Institute of Agriculture, Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases, No. 4, April 1912.

Ceylon Commercial Monthly for March and April 1912.

Note on an Inspection Tour in the Forests of Coorg by F. Beadon Bryant, C. S. I., February 1912.

American Forestry for April 1912.

The Fauna of British India, Coleoptera. General Introduction and Cicindelidae and Paussidae by W. W. Fowler.

The Indian and Eastern Engineer for May 1912.

Commercial Guide to the Forest Economic Products of India, by R. S. Pearson, I. F. S.

A further Note on Some Casuarina Insect Pests of Madras by V. S. Iyer.

Bark-Boring Beetle Attack in the Coniferous Forests of the Simla Catchment Area 1907—11 by R. S. Hole, I. F. S.

Prospectus of the Agricultural Research Institute and College, Pusa (revised) 1912.

Memoirs of the Department of Agriculture in India, Vol. II, No. 9, Life Histories of Indian Insects—II. Some Aquatic Rhynchota and Coleoptera.

The Scottish Geographical Magazine for May 1912.

The Agricultural Journal of India, Vol. VII, Pt. II, for April 1912.

Printed at the Pioneer Press, by GEO. SIM, No. 792—10-7-12.

GAZETTE NOTIFICATIONS.

1.—Gazette of India.

20th June 1912.—No. 394-F.—110-4.—Consequent on the grant of privilege leave for 3 months and furlough for 3 months, in continuation thereof, to Mr. E. S. Carr, Conservator of Forests, 1st grade, in the Burma Government's Notification No. 70, dated the 21st May 1912, Mr. G. R. Long, Deputy Conservator of Forests, Burma, is appointed to officiate as Conservator of Forests, 3rd grade, until further orders, with effect from the afternoon of 28th May 1912, the date on which he assumed charge of the Tennaserim Circle, Burma.

2.—Madras Gazette.

20th May 1912.—No. 220.—Under article 260 of the Civil Service Regulations, Mr. A. Wimbush, District Forest Officer, South Malabar, is granted privilege leave for three months with effect from or after the 10th June 1912.

25th May 1912.—No. 227.—The privilege leave for one month granted to Mr. C. M. Hodgson, District Forest Officer, Anantapur, by the Board of Revenue in its notification, published on page 750 of Part II of the *Fort St. George Gazette*, dated 30th April 1912, is extended by ten days.

No. 225.—Under article 260 of the Civil Service Regulations, Mr. B. H. Barlow-Poole, District Forest Officer, South Kurnool, is granted privilege leave for three months with effect from or after the 1st August 1912.

4th June 1912.—No. 244.—Under article 260 of the Civil Service Regulations, Mr. D. A. Stracey, Extra Assistant Conservator of Forests, is granted privilege leave for three months with effect from the date of relief.

No. 230.—The following posting of a Forest Officer is ordered :—

Mr. Cecil Claude Wilson, Assistant Conservator of Forests, to act as District Forest Officer, South Malabar Division, during the absence on leave of Mr. A. Wimbush or until further orders.

10th June 1912.—No. 257.—The following postings of Forest Officers are ordered :—

(1) Mr. Emmanuel Cajetan Martin Mascarenhas, Extra Assistant Conservator of Forests, *to be* District Forest Officer, South Salem Division.

(2) M. R. Ry. Coimbatore Muthuswami Maduranayakam Pillai Avargal, District Forest Officer, South Salem Division, *to be* District Forest Officer, Nellore.

3.—Bombay Gazette.

23rd May 1912.—No. 1134.—Mr. K. E. Kotwal, Extra Assistant Conservator of Forests and Sub-Divisional Forest Officer, Western Division, Kanara, who was on three months' privilege leave from the 16th February 1912 returned to duty and took over the sub-divisional charge from Mr. W. A. Miller, Divisional Forest Officer, Western Division, Kanara, on the forenoon of the 16th instant.

27th May 1912.—No. 5008.—In supersession of the orders issued in Government Notification No. 3534, dated 13th April 1912, Mr. Rustamji Hormusji Madan, Extra Deputy Conservator of Forests and Divisional Forest Officer, Kolaba, is granted privilege leave for three months in combination with furlough for twenty-one months.

3rd June 1912.—No 1468.—Messrs. S. P. Limaye, Extra Assistant Conservator of Forests, and A. C. Hiley, Assistant Conservator of Forests, respectively delivered over and received charge of the Sub-Divisional Forest Office, Kanara Southern Division, on the afternoon of the 21st instant.

4th June 1912.—No. 825.—Messrs. L. Napier, Deputy Conservator of Forests, and D. N. Damle, Extra Assistant Conservator of Forests, respectively delivered over and received charge of the Sub-Divisional Forest Office, East Khandesh, on the forenoon of 23rd May 1912.

5th June 1912.—No. 5289.—Mr. O. H. L. Napier, Deputy Conservator of Forests and Divisional Forest Officer, East Khandesh, is granted privilege leave for two months and twenty-nine days with effect from 19th July 1912 or the subsequent date on which he may be relieved.

No. 1514.—Mr. V. D. P. Rebeiro, Extra Deputy Conservator of Forests, and Mr. W. E. Copleston, Deputy Conservator of Forests, respectively delivered over and received charge of the Dharwar Forest Division on the afternoon of the 28th May 1912.

7th June 1912.—No. 615.—Mr. A. C. Robinson, Extra Deputy Conservator of Forests, delivered over and Mr. V. D. P. Rebeiro, Extra Deputy Conservator of Forests, received charge of the office of Kolaba Divisional Forest Office on the 30th day of May 1912 in the afternoon.

8th June 1912.—No. 5424.—His Excellency the Governor in Council is pleased to appoint Mr. Dinkar Narayan Damle to hold charge of the office of the Divisional Forest Officer, East Khandesh, in addition to his own duties, during the absence on privilege leave of Mr. O. H. L. Napier or pending further orders.

10th June 1912.—No. 650.—Mr. A. C. Robinson, Extra Deputy Conservator of Forests, delivered over and Mr. A. N. Master, Extra Assistant Conservator of Forests, received charge of the office of the Divisional Forest Officer, South Thana, on the 1st June 1912 in the forenoon.

11th June 1912 —No. 963.—The Honourable Mr. G. P. Millett, Conservator of Forests, and Mr. D. A. Thomson, Deputy Conservator of Forests, respectively delivered over and received charge of the Division and Sub-Division Forest offices, Poona, in the afternoon of the 1st June 1912.

12th June 1912.—No. 1640.—Messrs. A. N. Master and S. P. Limaye, Extra Assistant Conservators of Forests, respectively delivered over and received charge of the Bijapur Forest Division on the afternoon of the 30th May 1912.

No. 1642.—Messrs. H. B. Clayton, I.C.S., and A. R. Bonus, I.C.S., respectively delivered over and received charge of the Ratnagiri Forest Division on the forenoon of the 4th June 1912.

14th June 1912.—No. 1745.—Mr. W. E. Copleston, Deputy Conservator of Forests, and Mr. N. D. Satarawala, Extra Deputy Conservator of Forests, respectively delivered over and received charge of the Dharwar Forest Division on the forenoon of the 4th June 1912.

15th June 1912.—No. 707.—Mr. L. S. Koppikar, Extra Assistant Conservator of Forests, returned from furlough and reported himself for duty on the 15th instant in the forenoon. He is attached to the office of the Conservator of Forests, Northern Circle, as a temporary measure.

No. 1048.—Messrs. G. R. Duxbury, Deputy Conservator of Forests, and C. G. Dalia, Extra Assistant Conservator of Forests, respectively delivered over and received charge of the Divisional Forest Office, North Nasik, on the forenoon of the 10th June 1912.

18th June 1912.—No. 736.—Mr. T. N. Koppikar, Extra Assistant Conservator of Forests, delivered over and Mr. S. B. Bendigiri, Extra Assistant Conservator of Forests, received charge of the office of the Sub-Divisional Forest Officer, Central Thana, on the 14th June 1912 in the afternoon.

4.—Bengal Gazette.

21st May 1912.—No. 10.—Mr. J. R. P. Gent, Assistant Conservator of Forests, attached to Buxa Forest Division, is transferred to Kurseong Forest Division as an attached officer with headquarters at Kurseong.

27th May 1912.—No. 11.—Mr. E. E. Slane, Extra Assistant Conservator of Forests, attached to Sunderbans Forest Division, is granted privilege leave for three months.

24th June 1912.—No. 12-F.—Mr. J. R. P. Gent, Assistant Conservator of Forests, attached to Kurseong Division, is posted to the charge of the Kurseong Division and the Directorship of the Kurseong Forest School in place of Mr. H. S. Gibson, Assistant Conservator of Forests, proceeding on leave.

24th June 1912.—No. 13-F.—Mr. H. S. Gibson, Assistant Conservator of Forests, Kurseong Division, and Director of the Kurseong Forest School, is granted privilege leave, under article 260 of the Civil Service Regulations, for two months and fifteen days, with effect from the 16th July 1912 or such later date as he may be relieved of his duties by Mr. J. R. P. Gent, Assistant Conservator of Forests.

5.—Assam Gazette.

21st May 1912.—No. 545R.—Mr. Ram Nath Mukharji, Extra Assistant Conservator of Forests, attached to the Goalpara Forest Division, is allowed privilege leave for two months, under article 260 of the Civil Service Regulations, with effect from the 1st June 1912.

27th May 1912.—No. 635R.—Mr. W. R. LeG. Jacob, Deputy Conservator of Forests, was attached to the Direction Division, Assam Forest Circle, from the 7th to the 19th May 1912, both days inclusive.

6.—Bihar and Orissa Gazette.

25th May 1912.—No. 393R(B).—Mr. G. M. Cooper, Assistant Conservator of Forests, is transferred from the Singhbhum Forest Division, with effect from 1st June 1912, and is posted to duty in the office of the Conservator of Forests, until further orders.

7.—United Provinces Gazette.

Nil.

8.—Punjab Gazette.

27th May 1912.—*No.* 317.—*Appointment.*—Consequent on the departure on privilege leave of Lala Sunder Das and Lala Atma Ram, Mian Budhi Singh, Forest Ranger, 2nd grade, was appointed to officiate as Extra Assistant Conservator of Forests on the dates noted below :—

13th October 1911 to 23rd December 1911.
2nd January 1912 to 28th February 1912.

And with effect from the 25th April 1912 Mian Budhi Singh is again appointed to officiate *vice* Lala Daulat Ram, Extra Assistant Conservator of Forests, on combined leave.

5th June 1912.—*No.* 355.—*Notification.*—Lala Atma Ram, Extra Assistant Conservator of Forests, made over charge of his duties as an attached officer in the Hazara Division at Abbottabad on the afternoon of the 15th April and received charge of the Multan and Pir Mahal Divisions from Lala Daulat Ram, Extra Assistant Conservator of Forests, on the afternoon of the 24th April. From the same date Lala Daulat Ram proceeded on 2 months and 6 days' privilege leave combined with extraordinary leave without allowances for 3 months and 24 days.

No. 382.—*Leave.*—Mr. E. A. Greswell, Assistant Conservator of Forests, was granted one month's examination leave, with effect from 1st April 1912 to 30th April 1912.

9.—Central Provinces Gazette.

28th May 1912.—No. 1058.—Privilege leave for one month, under article 260 of the Civil Service Regulations, is granted to Mr. A. St. V. Beechey, Deputy Conservator of Forests, in charge of the Balaghat Forest Division, with effect from the 15th June 1912, or the subsequent date on which he may avail himself of it.

No. 1059.—Mr. J. Carr, Assistant Conservator of Forests, attached to the Balaghat Forest Division, is placed in charge of that Division, during the absence on leave of Mr. Beechey, or until further orders.

30th May 1912.—No. 1067.—Privilege leave for three months, in combination with special leave for three months, under articles 233 (ii), 260, and 316 of the Civil Service Regulations, is granted to Mr. C. F. Bell, Deputy Conservator of Forests, attached to the Nimar Forest Division, with effect from the 15th June 1912, or the subsequent date on which he may be permitted to avail himself of it.

No. 1074.—Mr. Vinayak Chimnaji Bhagwat, Extra Assistant Conservator of Forests, was attached to the Damoh Forest Division from the 24th to the 30th April 1912.

10.—Burma Gazette.

22nd May 1912.—No. 322—89-9-F.—The three months' examination leave granted to Mr. M. C. C. Bonig, Extra Assistant Conservator of Forests, Andamans, with effect

from the afternoon of the 6th April 1912, in the Notification of this Department No. 200-F, dated the 19th April 1912, is cancelled.

From the same date Mr. Bonig s services are placed at the disposal of the Government of Burma for special duty for a period of about three months.

On the expiry of the above period, Mr. Bonig is granted privilege leave for three months.

The services of Mr. A. R. Brown, Extra Assistant Conservator of Forests on the Burma cadre, are, as already notified, placed at the disposal of the Superintendent of Port Blair for employment in the Andamans Forest Department, *vice* Mr. Bonig.

29*th May* 1912.—No. 78.—Under the provisions of articles 232, 260, 233 and 311 (*b*) of the Civil Service Regulations, Mr. A. B. Nixon, Assistant Conservator of Forests, was granted privilege leave for one month and eight days and furlough on medical certificate in continuation thereof for a total period of eight months, with effect from the 22nd February 1912.

This department Notification No. 26, dated the 7th March 1912, and No. 61, dated the 16th May 1912, are cancelled.

31*st May* 1912.—No. 10.—With reference to Revenue (Forest) Department Notification No. 62, dated the 16th May 1912, and subsequent telegraphic orders, Mr. G. K. Parker, Deputy Conservator of Forests, made over, and Mr. C. Gwyer, Assistant Conservator of Forests, received, charge of the Thayetmyo Forest Division, as a temporary measure, on the afternoon of the 25th May 1912.

1*st June* 1912. —No. 12.—With reference to Revenue (Forest) Department Notification No. 57, dated the 6th May 1912, Mr. C. G. E. Dawkins, Assistant Conservator of Forests, made over charge of his duties as Subdivisional Forest Officer of Gangaw Subdivision in the Yaw Forest Division to Mr. S. H. Ker-Edie, Deputy Conservator of Forests, on the afternoon of the 24th May 1912, and availed himself of the leave granted him in the above-quoted notification from the forenoon of the 25th May 1912.

5*th June* 1912.—No. 13.—With reference to Revenue (Forest) Department Notification No. 65, dated the 16th May 1912, Mr. J. V. Young, Assistant Conservator of Forests, attached to the Pyinmana Forest Division, relinquished charge of his duties in that division on the afternoon of the 1st June 1912.

No. 14.—*Read* "12th December 1911" *for* "13th December 1911" in Southern Circle's Notification No. 11, dated the 20th May 1912.

6*th June* 1912.—No. 80.—Mr. E S. Carr, Conservator of Forests, made over, and Mr. G. R. Long, Deputy Conservator of Forests, received, charge of the office of Conservator of Forests, Tenasserim Circle, on the 28th May 1912, afternoon.

11*th June* 1912.—No. 11.—With reference to Revenue (Forest) Department Notification No. 63, dated the 16th May 1912, Mr. G. R. Jeffery, Deputy Conservator of Forests, made over, and Mr. G K. Parker, Deputy Conservator of Forests, received, charge of the Prome Forest Division, on the forenoon of the 7th June 1912.

13*th June* 1912.—No. 11.—On return from the one month and fifteen days' privilege leave granted in this office Notification No. 9, dated the 25th May 1912, Mr. A. E. Elmore, Forest Ranger, 3rd grade, is posted to the Mu Forest Division.

No. 12.—With reference to Revenue (Forest) Department Notification Nos. 75 and 76, dated the 22nd May 1912, Mr. D. H. Allan, Extra Deputy Conservator of Forests, made over, and Mr. H. R. Blanford, Deputy Conservator Forests, in charge of the Katha Division, received, charge of the Mansi Forest Division, on the afternoon of the 11th June 1912.

13*th June* 1912.—No. 82.—Under the provisions of article 260 of the Civil Service Regulations, privilege leave for twenty-four days is granted to Mr. J. G. F. Marshall, Extra Assistant Conservator of Forests, on duty in the Toungoo Forest Division, with effect from the 1st July 1912, or the subsequent date on which he may avail himself of it.

No. 83.—Pending the arrival of Mr. G. R. Jeffery, Deputy Conservator of Forests, posted to the charge of the Thayetmyo Forest Division in Revenue Forest) Department Notification No. 63, dated the 16th May 1912, Mr. C. Gwyer, Assistant Conservator of Forests, on duty in the Thayetmyo Forest Division, is placed temporarily in charge of that division in place of Mr. G. K. Parker, Deputy Conservator of Forests, transferred.

No. 84.—On relief by Mr. G. K. Parker, Deputy Conservator of Forests, of the charge of the Prome Forest Division, Mr. G. R. Jeffery, Deputy Conservator of Forests, prior to his assumption of the charge of the Thayetmyo Forest Division, is placed on special duty in the Prome Forest Division.

15th June 1912.—No. 15.—With reference to Revenue (Forest) Department Notification No. 65, dated the 16th May 1912, Mr. H. W. A. Watson, Deputy Conservator of Forests, made over, and Mr. J. V. Young, Assistant Conservator of Forests, received, charge of the Ruby Mines Forest Division, on the afternoon of the 8th June 1912, and the former officer availed himself of the leave granted him in Revenue (Forest) Department Notification No. 64, dated the 16th May 1912, on the forenoon of the 9th June 1912.

15th June 1912.—No. 12.—With reference to Notification No. 332—89-9-F., dated the 22nd May 1912, of the Government of India in the Department of Revenue and Agriculture, Mr. M. C. C. Bonig, Extra Assistant Conservator of Forests, Andamans, reported his arrival in Rangoon on the forenoon of the 8th April 1912.

From the same date Mr. Bonig was attached to the Depôt and Agency Division on special duty with headquarters at Rangoon. (2) Mr. Bonig's special duty in Burma ended on the 5th June 1912, and from the afternoon of the same date he availed himself of the three months' privilege leave granted to him in the Government of India Notification quoted above.

20th June 1912.—No. 87.—Under the provisions of articles 233, 260 and 308 (*b*) of the Civil Service Regulations, privilege leave for three months combined with furlough for three months and five days was granted to Mr. H. W. A. Watson, Deputy Conservator of Forests, with effect from the date on which he availed himself of the privilege leave.

This Department Notification No. 64, dated the 15th May 1912, is cancelled.

TIMBER AND PRODUCE RATES.

C. LEARY & CO.'S LONDON MARKET REPORT.

1st to 31st May 1912.

EAST INDIA TEAK.—*Timber.*—The shortage of supplies at the shipping ports continues to be the outstanding feature of the market, and although the enquiry continues quiet, values are very firm. *Planks.*—The demand, though limited, has been good in proportion to the supplies; prices are consequently rather firmer both for Burma and Bangkok wood, and no easing off in values appears likely for some time to come. Java is firm in tone, though in only occasional request. Quotations are:—Timber £14 to £25 (Java £7 to £20); Flitches £16 to £24 (Hewn Java £10 to £17); Planks £14 to £25 (Java £12 to £16); all per load on c.i.f. terms. The arrivals of Timber were 208 loads from Burmah, 50 loads from Bangkok, and 50 loads from Java. The analysis of deliveries and stocks is as follows:—

	Deliveries for May. Loads.		Deliveries to 31st May. Loads.		Dock Stock. Loads.	
	Timber.	*Planks.*	*Timber.*	*Planks.*	*Timber.*	*Planks.*
1912 ...	451	381	2,191	1,647	2,618	3,903
1911 ...	173	343	1,321	1,404	2,604	3,514
1910 ...	307	306	1,788	1,555	1,538	3,108

PADOUK.—There is only an occasional enquiry.

PENCIL CEDAR.—*Logs.*—Only large and fine timber is in request; values range from about 3*s.* upwards per foot cube, calliper measure.

SATINWOOD.—East India.—There has been somewhat more enquiry, but there is still a considerable stock; quotations in parcel, 6*d.* to 1*s.* 6*d.*

ROSEWOOD.—East India.—Large logs of good quality would be well received; we quote £7 to £15 per ton.

EBONY.—Ceylon.—A parcel of really prime logs would do well. East India.—Limited supplies of large logs of good quality might be shipped to advantage. Quotations are:—Ceylon £7 to £15 per ton, East India £6 to £12.

MARKET RATES FOR FOREST PRODUCTS.

Name of Product.	Quotations, English or Indian.	Rates for May 1912.	Rates for June 1912.
Cardamoms ...	English, per lb.	2*s.* 9*d.* to 4*s.* 6*d.*	3*s.* 3*d.* to 5*s.* 6*d.*
Croton Seeds ...	,, ,, cwt.	70*s.* to 75*s.*	70*s.* to 75*s.*
Cutch ...	,, ,, ,,	29*s.* to 37*s.* 6*d.*	29*s.* to 37*s.* 6*d.*
,, (Tablets) ...	Burma, ,, ,,	Rs. 45 to Rs. 50	Rs. 45 to Rs. 55.
Gum, Arabic—			
Karachi ...	English, ,, ,,	27*s.* 6*d.* to 35*s.*	27*s.* 6*d.* to 35*s.*
Madras ...	,, ,, ,,	27*s.* 6*d.* to 35*s.*	27*s.* 6*d.* to 35*s.*
Gum, Kino ...	,, ,, lb.	6*d.* to 1*s.*	6*d.* to 1*s.*
Myrabolans—			
Bengal ...	,, ,, cwt.	3*s.* 9*d.* to 4*s.* 3*d.*	3*s.* 9*d.* to 4*s.* 3*d.*
Bombay ...	,, ,, ,,	4*s* 6*d.* to 6*s.* 9*d.*	4*s.* 6*d.* to 6*s.* 9*d.*
Madras ...	,, ,, ,,	4*s.* 6*d.* to 5*s.*	4*s.* 6*d.* to 5*s.*
Myrabolans ...	Indian, per B. Md.	Rs. 2-6 to Rs. 2-8.	Rs. 2-8.
Nux Vomica—			
Bengal ...	English, per cwt.	7*s.* 6*d.*	8*s.*
Madras ...	,, ,, ,,	7*s.* 6*d.* to 8*s.* 6*d.*	8*s.* to 8*s.* 6*d.*
Cochin ...	,, ,, ,,	9*s.* 6*d.* to 12*s.* 6*d.*	9*s.* 6*d.* to 12*s.* 6*d.*
Oil, Lemon Grass ...	,, ,, oz.	$4\frac{3}{4}$*d.* to 5*d.*	$4\frac{3}{4}$*d.* to 5*d.*
,, Rosha Grass ...	Indian, per seer	Rs. 10-2 to Rs. 11-4.	Rs. 10.
,, Sandalwood ...	English, per lb.	11*s.* 6*d.*	11*s.* 6*d.*
Rosin ...	,, ,, cwt.	16*s.* 3*d.* to 16*s.* 6*d.*	16*s.* 3*d.* to 16*s.* $7\frac{1}{2}$*d.*
,, ...	Indian, ,, ,,	Rs. 16-8 to Rs. 17.	Rs. 16-8 to Rs. 17.
Turpentine ...	English, ,, ,,	34*s.* 6*d.* to 38*s.*	36*s.* to 37*s.* 3*d.*
Rubber, India—			
Assam ...	Indian, per B. Md.	Rs. 70 to Rs. 195.	Rs. 50 to Rs. 170.
,, ...	English, per lb.	3*s.* 8*d.* to 4*s.* 2*d.*	3*s.* 3*d.* to 4*s.*
Burma ...	,, ,, ,,	2*s.* to 2*s.* 9*d.*	2*s.* to 2*s.* 9*d.*
Rubber, Para ...	,, ,, ,,	4*s.* $5\frac{1}{2}$*d.* to 4*s.* 8*d.*	4*s.* $2\frac{1}{2}$*d.* to 4*s.* $10\frac{1}{2}$*d.*
Seed-lac ...	,, ,, cwt.	45*s.* to 60*s.*	45*s.* to 60*s.*
Shellac, T.N. Diamond	Indian, per B. Md.	Rs. 31 to Rs. 32.	Rs. 29-8 to Rs. 31-8.
,, T.N. Orange	English, per cwt.	63*s.* to 64*s.*	62*s.* to 63*s.* 6*d.*
Tamarinds—			
Calcutta ...	,, ,, ,,	9*s.* to 10*s.*	9*s.* to 10*s.*
Madras ...	,, ,, ,,	4*s.* to 5*s.*	4*s.* to 5*s.*
Teak (Selected Indian, 1st class).	Indian, per ton of 50 c.ft.	Rs. 115 to Rs. 135.	Rs. 125 to Rs. 145.

Note.—(1) B. Md. indicates Bengal Maund, which is equal to 80 lbs.
(2) T. N. in Diamond and T. N. Orange are commercial terms applied to certain grades of shellac.

LIST OF BOOKS AND PUBLICATIONS RECEIVED BY THE HONORARY EDITOR DURING JUNE 1912.

Bulletin Bibliographique Hebdomadaire, Nos. 13, 14, 15 and 16, 1912.

United States Department of Agriculture. Experiment Station Record, Vol. XXVI, No. 3, Vol. XXV, Index Number and Vol. XXVI, Nos. 4, 5 and 6.

Report of Progress of Stream Measurements for 1910, Department of the Interior Dominion of Canada.

American Forestry for May 1912.

Memoirs of the Department of Agriculture in India, Eri Silk, Vol. IV, No. 1, Entomological Series.

Indian Engineering for June 1st, 8th, 15th and 22nd.

Indian Field for May 30th, June 6th, 13th, 20th, and 27th.

Tropical Agriculturist for May and June 1912.

The Forest Flora of New South Wales, Vol. V, Pt. 7.

Indian Trade Journal for June 6th, 13th, 20th and 27th.

International Institute of Agriculture, Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases for May 1912

Bulletin Economique de L'Indochine No. 95, for March and April 1912.

Revue des Eaux et Forêts, No. 10 for May 1912.

Progress Report of Forest Administration in Coorg for 1910-11.

Reports on the Forest Administration in Burma for the year 1910-11.

The Indian and Eastern Engineer for June 1912.

Madras Agricultural Calendar 1912-13.

The Ceylon Commercial Monthly for May 1912.

Annual Administration Report of the Forest Department of the Madras Presidency for 1909-10.

Printed at the Pioneer Press, by GEO. SIM, No. 951—9-8-'12.

GAZETTE NOTIFICATIONS.

1.—Gazette of India.

5th July 1912.—No. 1638—170-4.—Mr. S. Carr, F.C.H., Assistant Inspector-General of Forests to the Government of India, is granted privilege leave for three months combined with furlough for 1 year 8 months and 19 days, under articles 246, 260, 233, and 308 (*b*) of the Civil Service Regulations, with effect from the 1st August 1912, or from the subsequent date on which he may avail himself of the privilege leave.

No. 1639—170-4.—Mr G. E. S. Cubitt, Deputy Conservator of Forests, Burma, is appointed Assistant Inspector-General of Forests to the Government of India with effect from the date on which he assumes charge of the office from Mr. S. Carr.

4th July 1912.—No. 574—105-6.—Mr. A. Rodger, Deputy Conservator of Forests, Burma, at present on deputation as Instructor at the Forest Research Institute and College, Dehra Dun, is granted privilege leave for three months combined with furlough for 1 year and 3 months, with effect from the afternoon of 27th June 1912, from which date he reverts to the cadre of the Burma Forest Service.

2.—Madras Gazette.

10th June 1912.—No. 273.—The following postings of Forest Officers are ordered :—

Khan Sahib Saiyid Burhanuddin Husain Sahib Bahadur, Extra Deputy Conservator of Forests, on return from leave, *to be* District Forest Officer, Guntur, during the absence of Mr. J. Scot on other duty or until further orders.

Mr. Alfred Bertwright Myers, District Forest Officer, Ramnad, *to be* District Forest Officer, South Arcot.

27th June 1912.—No. 294.—The following promotion of a Forest Officer is ordered :—

M. R. Ry. V. Subramania Aiyar Avargal, Extra Assistant Conservator of Forests, *to be* Extra Deputy Conservator of Forests, on probation, with effect from the 23rd June 1912 on which date he joined his appointment as Assistant Instructor in the Madras Forest College, Coimbatore

28th June 1912.—*Postings*.—Mr. W. C. Hart, on return from Dehra Dun, is posted to South Malabar district to work under the District Forest Officer.

M. R Ry. P. Venkataraman, on return from Dehra Dun, is posted to South Coimbatore to work under the District Forest Officer

3rd July 1912.—*Leave*.—Under article 260 of the Civil Service Regulations, the Board grants privilege leave for one month to Mr. G. H. Welchman, Special Forest Officer for the Parlakimedi Maliahs, from or after the 9th July 1912.

Leave.—Under article 260 of the Civil Service Regulations, the Board grants privilege leave for one month to Syed Edullah Saheb, Extra Assistant Conservator of Forests, from or after the 20th July 1912

6th July 1912.—No. 308.—The following posting of a Forest Officer is ordered :—

Mr. Alfred Alyson Fennel Minchin, District Forest Officer, Bellary, on relief by M. R. Ry. Rao Bahadur V. Alwar Chetti Garu, to do duty under the District Forest Officer, South Kurnool.

Mr. Alfred Alyson Fennel Minchin, *to be* District Forest Officer, South Kurnool, during the absence on leave of Mr. B. H. Barlow-Poole or until further orders.

20th July 1912.—No. 331.—The following promotions of Forest Officers are ordered :—

Mr. Alfred Wyndham Lushington, Conservator of Forests, 2nd grade, *permanent* and acting in the 1st grade, *to be* Conservator of Forests, 1st grade, *permanent*, with effect from the date of Mr. C. E. Brasier's death.

Mr. Percy Manners Lushington, Conservator of Forests, 3rd grade, *permanent*, and acting in the 2nd grade, *to be* Conservator of Forests, 2nd grade, *permanent*, *vice* Mr. A. W. Lushington.

Mr. John Sinclair Battie, Deputy Conservator of Forests and Acting Conservator of Forests, 3rd grade, *to be* Conservator of Forests, 3rd grade, *permanent*, *vice* Mr. P. M. Lushington.

3.—Bombay Gazette.

22nd June 1912.—No. 785.—Mr. S. B. Bendigiri, Extra Assistant Conservator of Forests, delivered over and Mr. V. D. P. Rebeiro, Extra Deputy Conservator of Forests, received charge of the office of the Sub-Divisional Forest Office, Kolaba, on the 12th June 1912 in the afternoon.

24th June 1912.—No. 823.—Mr. V. D. P. Rebeiro, Extra Deputy Conservator of Forests, delivered over and Mr. T. N. Koppikar, Extra Assistant Conservator of Forests, received charge of the office of the Sub-Divisional Forest Office, Kolaba, on the 18th June 1912, in the afternoon.

9th July 1912.—No. 6364.—Mr. G. R. Duxbury, Deputy Conservator of Forests, and Divisional Forest Officer, South Nasik, is granted privilege leave for three months in combination with furlough for eleven months, with effect from 16th August 1912 or the subsequent date on which he may be relieved.

15th July 1912.—No. 1593.—Mr. H. W. Starte, Assistant Conservator of Forests, relinquished charge of his duties in the North Khandesh Division on the forenoon of the 14th June 1912, and reported himself for duty at Nasik to the Divisional Forest Officer, South Nasik, on the forenoon of the 21st June 1912.

4.—Bengal Gazette.

Nil.

5.—Assam Gazette.

18th June 1912.—No. 939R.—Mr. C. J. Rowbotham, Assistant Conservator of Forests, in charge of the Nowgong Forest Division, is allowed privilege leave for twelve days, under article 260 of the Civil Service Regulations, with effect from the 12th June 1912, or the subsequent date on which he avails himself of it.

29th June 1912.—No. 1066R.—Mr. W. Meiklejohn, Assistant Conservator of Forests, in charge of the Central Range, Darrang Forest Division, is transferred to the Khasi and Jaintia Hills Forest Division and is attached to that division with effect from the 24th June 1912.

29th June 1912.—No. 1076R.—Mr. L. J. Delanougerede, Probationary Extra Assistant Conservator of Forests, attached to the Sibsagar Forest Division, is allowed privilege leave for one month, under article 260 of the Civil Service Regulations, with effect from the 1st July 1912.

10th July 1912.—No. 1197R.—Mr. D. P. Copeland, Deputy Conservator of Forests, in charge of the Kamrup and Darrang Forest Divisions, is allowed privilege leave for three months, under articles 260 and 301 of the Civil Service Regulations, with effect from the 1st August 1912.

10th July 1912.—No. 1200R.—Mr. J. S. Owden, Assistant Conservator of Forests, attached to the Lakhimpur Forest Division, is appointed to hold charge of the Kamrup Forest Division during the absence on leave of Mr. D. P. Copeland, or until further orders.

10th July 1912.—No. 1203R.—Mr. W. Meiklejohn, Assistant Conservator of Forests, attached to the Khasia and Jaintia Hills Forest Division, is appointed to hold charge of the Darrang Forest Division during the absence on leave of Mr. D. P. Copeland, or until further orders.

6.—Bihar and Orissa Gazette.

22nd June 1912.—No. 1329R. (B.)—Mr. W. Breakey, Extra Assistant Conservator of Forests, is allowed leave on medical certificate for six months in extension of the leave granted to him in Notification No. 447 For., dated the 23rd January 1912, issued by the Government of Bengal.

21st June 1912.—No. 3 (Forests).—Mr. O. A. Dodsworth, Probationary Extra Assistant Conservator of Forests, availed himself, on the 17th June 1912, of the privilege leave granted him in this Office Notification No. 1 (Forests), dated the 28th May 1912.

21st June 1912.—No. 4 (Forests).—Privilege leave for one month is granted to Mr. Bhusan Chandra Das, Probationary Extra Assistant Conservator of Forests, with effect from 15th September 1912, or such subsequent date as he may avail himself thereof.

7.—United Provinces Gazette.

24th June 1912.—No. 5.—Mr. V. A. Herbert, Assistant Conservator of Forests, on special duty, Almora District forests, privilege leave for 2 months and 25 days, with effect from the 18th July 1912, or subsequent date.

26th June 1912.—No. 6.—Babu Praphulla Chandra Kanjilal, Probationary Extra Assistant Conservator of Forests, attached to Gorakhpur Forest Division of the Eastern Circle, privilege leave for one month and three days, with effect from the 8th July 1912.

Transfer.

26th June 1912.—No. 7.—Babu Ram Swarup, Extra Assistant Conservator of Forests, attached to the Ramnagar Forest Division of the Western Circle, to the Kheri Forest Division of the Eastern Circle, as an attached officer.

16th July 1912.—No. 8.—Babu Praphulla Chandra Kanjilal, Probationary Extra Assistant Conservator of Forests, attached to the Gorakhpur Forest Division of the Eastern Circle, on return from leave, attached to the Direction Division of the same Circle.

20th July 1912.—No. 9.—In this Department Notification No. 5, dated the 24th June 1912, printed on page 587 of part I of the *United Provinces Gazette*, dated the 29th June 1912, *for* "2 months and 25 days" *read* "2 months and 24 days."

8.—Punjab Gazette.

26th June 1912.—No. 399.—*Notification.*—Consequent on his transfer from the Lahore to the Bashahr Forest Division, Mr. E. A. Greswell, Assistant Conservator of Forests, made over charge of his duties at Lahore on the afternoon of the 4th May 1912 and took charge of his duties at Kotgarh on the afternoon of the 14th May 1912 as an attached officer.

17th July 1912.—No. 434.—*Leave.*—Mr. L. B. Holland, Assistant Conservator of Forests, was granted examination leave, with effect from 11th April 1912 to 14th May 1912.

9.—Central Provinces Gazette.

25th June 1912.—No. 1227.—Mr. Chintaman Vishwanath Sarwate, Extra Assistant Conservator of Forests, attached to the Chhindwara Forest Division, held charge of the Seoni Forest Division from the 6th April to the 5th May 1912.

25th June 1912.—No. 13.—Mr. D. C. McDonald, Probationary Extra Assistant Conservator of Forests, is posted to the charge of the Yeotmal Range, in the Yeotmal Forest Division.

No. 14.—Mr. Muhammad Ismail, Extra Assistant Conservator of Forests, attached to the Bilaspur Forest Division, is transferred to the Raipur Forest Division as an attached officer.

10th July 1912.—No. 1298.—Mr. A. A. Dunbar-Brander, Deputy Conservator of Forests, attached to the General Direction Division, is attached to the Direction Division, Southern Circle, Central Provinces.

11th July 1912.—No. 1306.—Privilege leave for three months, in combination with furlough for nine months, under articles 233 (i), 260, and 338 of the Civil Service Regulations, is granted to Mr. L. K. Martin, Extra Deputy Conservator of Forests, in charge of the Nimar Forest Division, with effect from the 1st August 1912, or the subsequent date on which he may avail himself of it.

No. 1307.—Mr. L. Mason, Assistant Conservator of Forests, attached to the Hoshangabad Forest Division, is transferred to the charge of the Nimar Forest Division.

15th July 1912.—No. 1335.—Privilege leave for three months, in combination with furlough for three months, under articles 233 (i), 260, and 308 of the Civil Service Regulations, is granted to Mr. H. E. Bartlett, Deputy Conservator of Forests, in charge of the Melghat Forest Division, with effect from the 12th August 1912, or the subsequent date on which he may avail himself of it.

No. 1336.—Mr. A. A. Dunbar-Brander, Deputy Conservator of Forests, attached to the Direction Division, Southern Circle, is transferred to the charge of the Melghat Forest Division.

22nd July 1912.—No. 1392.—Mr. C. M. Harlow, Assistant Conservator of Forests, attached to the Saugor Forest Division, is transferred to the Direction Division, Northern Circle, Central Provinces.

10.—BURMA GAZETTE.

22nd June 1912.—No. 13.—With reference to Revenue (Forest) Department Notification No. 221, dated the 27th November 1911, Mr. W. Lawton, Assistant Conservator of Forests, was attached to the Prome Forest Division, from 14th to 19th December 1911, both days inclusive.

25th June 1912.—No. 89.—Under the provisions of article 260 of the Civil Service Regulations, privilege leave for three months is granted to Mr. T. W. Forster, Extra Deputy Conservator of Forests, on duty in the Tharrawady Forest Division, with effect from the 15th July 1912, or the subsequent date on which he may avail himself of it.

28th June 1912.—No. 93.—Mr. E. V. Ellis, Deputy Conservator of Forests, on working-plans duty in the Tharrawaddy Forest Division, is transferred from Tharrawaddy and is appointed to be Personal Assistant to the Conservator of Forests, Pegu Circle, in place of Mr. G. E. S. Cubitt, Deputy Conservator of Forests, on his proceeding to take up the appointment of Assistant Inspector-General of Forests.

29th June 1912.—No. 16 (*Corrigendum*).—In this Circle Notification No. 15, dated the 15th June 1912, *for* the words "Notification No. 64, dated the 16th May 1912," *read* "Notification No. 87, dated the 20th June 1912."

2nd July 1912.—No. 94.—Mr. C. E. Parkinson, a stipendiary student deputed by the Andamans Administration to the Imperial Forest College, Dehra Dun, is appointed to be a Probationary Extra Assistant Conservator of Forests on Rs. 175 per mensem in the Burma Provincial Forest Service, with effect from the 1st July 1912, and is posted to duty in the Andamans.

No. 95.—Mr. R. B. Finney, a stipendiary student deputed by this Province to the Imperial Forest College, Dehra Dun, is appointed to be a Probationary Extra Assistant Conservator of Forests on Rs. 175 per mensem, with effect from the 1st July 1912, and is posted to duty in the Bhamo Forest Division

No. 96.—Mr. G. K. Murphy, a stipendiary student deputed by this Province to the Imperial Forest College, Dehra Dun, is appointed to be a Probationary Extra Assistant Conservator of Forests on Rs. 175 per mensem, with effect from the 1st July 1912, and is posted to duty in the Thayetmyo Forest Division.

No. 97.—Mr. D. J. Monro, a stipendiary student deputed by this Province to the Imperial Forest College, Dehra Dun, is appointed to be a Probationary Extra Assistant Conservator of Forests on Rs. 175 per mensem, with effect from the 1st July 1912, and is posted to duty in the Yaw Forest Division.

No. 98.—Mr. P. Burnside, a stipendiary student deputed by this Province to the Imperial Forest College, Dehra Dun, is appointed to be a Probationary Extra Assistant Conservator of Forests on Rs. 175 per mensem, with effect from the 1st July 1912, and is posted to duty in the Toungoo Forest Division.

4th July 1912.—No. 99.—Mr. G. M. Turner, a stipendiary student deputed by this Province to the Imperial Forest College, Dehra Dun, on satisfactorily completing his third year's training at that college, is appointed to be a Probationary Extra Assistant Conservator of Forests on Rs. 175 per mensem, with effect from the 1st July 1912, and is posted to duty in the Prome Forest Division.

No. 100.—Mr. L. C. Secluna, a stipendiary student deputed by this Province to the Imperial Forest College, Dehra Dun, on satisfactorily completing his third year's training at that college, is appointed to be a Probationary Extra Assistant Conservator of Forests on Rs. 175 per mensem, with effect from the 1st July 1912, and is posted to duty in the Thaungyin Forest Division.

No. 101.—Mr. C. F. L. Mapp, a stipendiary student deputed by this Province to the Imperial Forest College, Dehra Dun, on satisfactorily completing his third year's training at that college, is appointed to be a Probationary Extra Assistant Conservator of Forests on Rs. 175 per mensem, with effect from the 1st July 1912, and is posted to duty in the Upper Chhindwin Forest Division.

No. 102.—Mr. C. S. Baldwin, a stipendiary student deputed by this Province to the Imperial Forest College, Dehra Dun, on satisfactorily completing his third year's training at that college, is appointed to be a Probationary Extra Assistant Conservator of Forests on Rs. 175 per mensem, with effect from the 1st July 1912, and is posted to duty in the Tharrawaddy Forest Division.

No. 103.—Mr. J. W. L. O'Hara, a stipendiary student deputed by this Province to the Imperial Forest College, Dehra Dun, on satisfactorily completing his third year's training at that college, is appointed to be a Probationary Extra Assistant Conservator of Forests on Rs. 175 per mensem, with effect from the 1st July 1912, and is posted to duty in the West Salween Forest Division.

9th July 1912..—No. 13.—With reference to Revenue (Forest) Department Notification No. 82, dated the 13th June 1912, Mr. J. G. F. Marshall, Extra Assistant Conservator of Forests, availed himself of the privilege leave granted him on the 4th July 1912, before noon.

10th July 1912 No. 14.—With reference to Revenue (Forest) Department Notification No. 98, dated the 2nd July 1912, Mr. P. Burnside, Probationary Extra Assistant Conservator of Forests, assumed charge of his duties in the Toungoo Forest Division, on the forenoon of the 4th July 1912.

10th July 1912.—No. 14 —With reference to Revenue (Forest) Department Notification No. 92, dated Rangoon, the 27th June 1912, Mr. H. R. Blanford, Deputy Conservator of Forests, made over, and Mr. D. H. Allan, Extra Deputy Conservator of Forests, on return from leave, assumed charge of the Mansi Forest Division, on the forenoon of the 8th July 1912.

11th July 1912.—No. 105.—Mr. G. K. Parker, Deputy Conservator of Forests, prior to his assumption of charge of the Prome Forest Division to which he was posted in this Department Notification No. 62, dated the 16th May 1912, was attached to that division on special duty from the 3rd to the 6th June 1912.

18th July 1912.—No 15.—With reference to Revenue (Forest) Department Notification No. 95, dated the 2nd July 1912, Mr. R. B. Finney, Probationary Assistant Conservator of Forests, reported himself for duty at Bhamo on the forenoon of 5th July 1912 and assumed charge of his duties in the Shwegu Subdivision of the Bhamo Forest Division, on the forenoon of the 12th July 1912.

18th July 1912.—No. 15.—With reference to Revenue (Forest) Department Notification No. 96, dated the 2nd July 1912, Mr. G. T. K. Murphy, Probationary Extra Assistant Conservator of Forests, assumed charge of his duties in the Thayetmyo Forest Division, on the afternoon of the 3rd July 1912.

18th July 1912.—No. 110.—On the conclusion of the working-plans duty to which he was reposted in this Department Notification No. 163, dated the 17th October 1911, Mr. A. H. M. Barrington, Assistant Conservator of Forests, is posted to duty in the Prome Forest Division.

23rd July 1912.—No. 15.—With reference to Revenue (Forest) Department Notification No. 103, dated the 4th July 1912, Mr. J. W. L. O'Hara, Probationary Extra Assistant Conservator of Forests, assumed charge of his duties in the West Salween Forest Division on the forenoon of the 17th July 1912.

No. 16.—With reference to Revenue (Forest) Department Notification No. 100, dated the 4th July 1912, Mr. L. C. Secluna, Probationary Extra Assistant Conservator of Forests, assumed charge of his duties in the Thaungyin Forest Division, on the forenoon of the 17th July 1912.

TIMBER AND PRODUCE RATES.

C. LEARY & CO.'S LONDON MARKET REPORT.

1st to 29th June 1912.

EAST INDIA TEAK.—*Timber.*—The demand for Burma and Bangkok wood during June has been very little, if any, better than during the preceding month, but shippers have little timber available for early delivery ; in the absence of business prices are more or less nominal, but sellers are very firm in their ideas of value. There is occasional enquiry for Java, which is realising steady rates. *Planks* have also been dull in tone, and there is no doubt present high quotations for the older descriptions are deterring many buyers from purchasing ; for Java there is also only occasional interest, despite the dearness of Burma and Siam wood. Quotations are : Timber £14 to £25 (Java £7 to £20) ; Flitches £16 to £24 (Hewn Java £10 to £17) ; Planks £14 to £25 (Java £12 to £16 ; all per load on c.i.f. terms. The arrivals of Timber were 50 loads from Burma, 117 loads from Bangkok, and 50 loads from Java. The analysis of deliveries and stocks is as follows :—

	Deliveries for June. Loads.		Deliveries to 29th June. Loads.		Dock Stock. Loads.	
	Timber.	*Planks.*	*Timber.*	*Planks.*	*Timber.*	*Planks.*
1912 ...	93	176	2,284	1,823	2,642	3,727
1911 ...	207	287	1,528	1,691	3,457	3,648
1910 ...	231	268	2,019	1,823	1,629	3,010

PADOUK.—The demand is very restricted.

PENCIL CEDAR.—*Logs*—The demand is restricted to clean sizeable wood ; values range from about 3*s.* upwards per foot cube, calliper measure.

SATINWOOD.—East India.—The tone is dull ; finely figured logs, however, would realise high prices. Quotations in parcel are per foot super. 6*d.* to 1*s.* 6*d.*

ROSEWOOD.—East India.—There is only a moderate business doing, but large prime logs might be shipped to advantage ; we quote £7 to £15 per ton.

EBONY.—Ceylon.—Only sizeable timber of good character should be shipped. East India.—Prime logs would do well. Quotations are :—Ceylon £7 to £15 per ton, East India £6 to £12.

MARKET RATES FOR FOREST PRODUCTS.

Name of Product.	Quotations, English or Indian.	Rates for June 1912.	Rates for July 1912.
Cardamoms ...	English, per lb.	3*s.* 3*d.* to 5*s.* 6*d.*	3*s.* 7*d.* to 5*s.* 8*d.*
Croton Seeds ...	,, ,, cwt.	70*s.* to 75*s.*	70*s.* to 75*s.*
Cutch ...	,, ,, ,,	29*s.* to 37*s.* 6*d.*	29*s.* to 37*s.* 6*d.*
,, (Tablets) ...	Burma, ,, ,,	Rs. 45 to Rs. 55.	Rs. 56 to Rs. 60.
Gum Arabic—			
Karachi ...	English, ,, ,,	27*s.* 6*d.* to 35*s.*	27*s.* 6*d.* to 35*s.*
Madras ...	,, ,, ,,	27*s.* 6*d.* to 35*s.*	27*s.* 6*d.* to 35*s.*
Gum, Kino ...	,, ,, lb.	6*d.* to 1*s.*	6*d.* to 1*s.*
Myrabolans—			
Bengal ...	,, ,, cwt.	3*s.* 9*d.* to 4*s.* 3*d.*	4*s.* to 5*s.*
Bombay ...	,, ,, ,,	4*s.* 6*d.* to 6*s.* 9*d.*	4*s.* 6*d.* to 7*s.* 3*d.*
Madras ...	,, ,, ,,	4*s.* 6*d.* to 5*s.*	4*s.* 9*d.* to 5*s.* 6*d.*
Myrabolans ...	Indian, per B. Md.	Rs. 2-8.	Rs. 2-6 to Rs. 2-8.
Nux Vomica—			
Bengal ...	English, per cwt.	8*s.*	8*s.* 6*d.*
Madras ...	,, ,, ,,	8*s.* to 8*s.* 6*d.*	8*s.* 6*d.* to 9*s.*
Cochin ...	,, ,, ,,	9*s.* 6*d.* to 12*s.* 6*d.*	9*s.* 6*d.* to 12*s.* 6*d.*
Oil, Lemon Grass ...	,, ,, oz.	$4\frac{3}{4}$*d.* to 5*d.*	(Not quoted).
,, Rosha Grass ...	Indian, per seer	Rs. 10.	(Season closed.)
,, Sandalwood ...	English, per lb.	11*s.* 6*d.*	11*s.* 6*d.*
Rosin ...	,, ,, cwt.	16*s.* 3*d.* to 16*s.* $7\frac{1}{2}$*d.*	15*s.* 9*d.* to 16*s.* 3*d.*
,, ...	Indian ,, ,,	Rs. 16-8 to Rs. 17.	Rs. 16-8 to Rs. 17.
Turpentine ...	English ,, ,,	36*s.* to 37*s.* 3*d.*	35*s.*
Rubber, India—			
Assam ...	Indian, per B. Md.	Rs. 50 to Rs. 170.	Rs. 50 to Rs. 160.
,, ...	English, ,, lb.	3*s.* 3*d.* to 4*s.*	3*s.* 4*d.* to 4*s.*
Burma ...	,, ,, ,,	2*s.* to 2*s.* 9*d.*	2*s.* to 3*s.*
Rubber, Para ...	,, ,, ,,	4*s.* $2\frac{1}{2}$*d.* to 4*s.* $10\frac{1}{2}$*d.*	4*s.* $2\frac{3}{4}$*d.* to 5*s.* $0\frac{1}{2}$*d.*
Seed-lac ...	,, ,, cwt.	45*s.* to 60*s.*	45*s.* to 60*s.*
Shellac, T. N. Diamond	Indian, per B. Md.	Rs. 29-8 to Rs. 31-8.	Rs. 29-12 to Rs. 30-4.
,, T. N. Orange	English, ,, cwt.	62*s.* to 63*s.* 6*d.*	62*s.*
Tamarinds—			
Calcutta ...	,, ,, ,,	9*s.* to 10*s.*	9*s.* to 12*s.*
Madras ...	,, ,, ,,	4*s.* to 5*s.*	4*s.* to 5*s.*
Teak (Selected 1st class).	Indian, per ton of 50 c.ft.	Rs. 125 to Rs. 145.	Rs. 115 to Rs. 135.

Note.—(1) B. Md indicates Bengal Maund, which is equal to 80 lbs.
(2) T. N. Diamond and T. N. Orange are commercial terms applied to certain grades of shellac.

LIST OF BOOKS AND PUBLICATIONS RECEIVED BY HONORARY EDITOR DURING JULY 1912.

Agricultural Bulletin of the Straits and Federated Malay States for April and May 1912 (2 copies).

Indian Engineering for June 29th, July 6th, 13th, 20th and 27th.

Annual Report of the Department of Land Records in the Bombay Presidency including Sindh for 1910-11.

L'Agronomie Tropicale Nos. 2, 3, 4 and 5 for February, March, April and May 1912.

Index of Plants, Botanic Gardens, Singapore, 1912.

India Rubber World for June 1912.

Bulletin Bibliographique Hebdomadaire Nos. 17, 18, 19, 20, 21 and 22.

The Indian Trade Journal for July 4th, 11th, 18th, and 25th.

Canadian Forestry Journal for May-June 1912.

American Forestry for June 1912.

Revue des Eaux et Forêts Nos. 12 and 13 for June and July 1912.

Report on the Forest Administration of the Central Provinces for 1910-11.

University of California Publications: The Production of the Lima Bean, Bulletin No. 224; and Tolerance of Eucalyptus for Alkali, Bulletin No. 225.

Records of the Geological Survey of India, Vol. XLII, Part 1, 1912.

Bulletin of the Bureau of Agricultural Intelligence and of Plant-diseases No. 6 for June 1912.

Annual Report of the Forestry Department, Southern Nigeria, for the year 1911.

Chief Conservator of Forests' Report on his visit to Mamu Reserve, Western Province, Southern Nigeria.

Progress Report of Forest Administration in the Mysore State for the year ending 30th June 1911.

Denny, Mott and Dickson's Wood Market Report, 1st July 1912.

Progress Report on Forest Administrations in the Jammu and Kashmir State for 1910-11.

The Indian and Eastern Engineer for July 1912.

Report on the Government Agri-Horticultural Gardens, Lahore, for 1911-12

Census of India, 1911, Vol. XII, Madras, Part I, Report, and Part II, Imperial and Provincial Tables.

Indian Field for July 4th, 11th, 18th and 25th.

Forestry Quarterly, Vol. X, No. 2 for June 1912.

Transactions of the Royal Scottish Arboricultural Society, Vol. XXVI, Part II, for July 1912.

Progress Report of Forest Administration in the Jodhpur State, Rajputana, for 1910-11.

Department of Land Records and Agriculture, Assam, Bulletin No. 11, Rhubarb and Bulletin No. 14, Asparagus.

United States Department of Agriculture, Experiment Station Record No. 7 for May 1912.

Printed at the Pioneer Press by GEO. SIM, No. 1094—'11-9-12.

GAZETTE NOTIFICATIONS.

1.—Gazette of India.

Nil.

2.—Madras Gazette.

Leave.

22nd July 1912.—No. 332.—Under article 336 of the Civil Service Regulations, Muhammad Habibulla Sahib, Probationary Extra Assistant Conservator of Forests, is granted leave on medical certificate for six months with effect from the 21st April 1912.

30th July 1912.—No. 340.—The following posting of a Forest Officer is ordered :—

Mr. F. R. Madan, Assistant Conservator of Forests, to do duty under the District Forest Officer, West Kurnool.

7th August 1912..—No. 352.—The follow posting of a Forest Officer is ordered :—

Mr. Bernard Francis Rigold, Assistant Conservator of Forests, *to be* District Forest Officer, Guntur, until further order

13th August 1912.—No. 354.—The Government sanction the grant of extraordinary leave without allowances to M. R. Ry. V. Subramania Aiyar Avargal, Extra Deputy Conservator of Forests, for fifteen days from 28th May 1912.

3.—Bombay Gazette.

26th July 1912.—No. 6878.—Mr. G. S. Butterworth, Assistant Conservator of Forests and Divisional Forest Officer, Kanara Southern Division, is granted special leave on urgent private affairs for thirty days with effect from 31st August 1912 or the subsequent date on which he may be relieved.

29th July 1912.—No. 6994.—His Excellency the Governor in Council is pleased to notify that Mr. Lakshman Shamrao Koppikar on return to duty was appointed to be Extra Assistant Conservator of Forests in the Northern Circle.

No. 6995.—His Excellency the Governor in Council is pleased to make the following appointments :—

Mr. C. E. L. Gilbert to be Divisional Forest Officer, South Nasik, *vice* Mr. G. R. Duxbury proceeding on leave.

Mr. Jahangir Hormasji Irani to be Divisional Forest Officer, North Thana.

Mr. Dalpatrai Jethanand Navani to do duty as Divisional Forest Officer, Sukkur, pending further orders.

Mr. E. G. Oliver to hold charge of the office of Working Plans Officer, Sind Circle, in addition to his own duties, pending further orders.

No. 7002.—His Excellency the Governor in Council is pleased to appoint Mr. P. E. Aitchison to act as Divisional Forest Officer, Kanara Southern Division, in addition to his own duties, during the absence on leave of Mr. G. S. Butterworth or pending further orders.

Central Circle.

No. 1837.—Messrs L. Napier, Deputy Conservator of Forests, and D. N. Damle, Extra Assistant Conservator of Forests, respectively delivered over and received charge of the East Khandesh Division on the afternoon of the 18th July 1912.

Northern Circle.

21st August 1912.—No. 1320.—Mr. C. E. L. Gilbert, Deputy Conservator of Forests, delivered over, and Mr. J. H. Irani, Extra Assistant Conservator of Forests, received charge of the office of the North Thana Division on the 15th August 1912 in the afternoon.

4.—Bengal Gazette.

23rd August 1912.—No. 14.—Mr. E. E Slane, Extra Assistant Conservator of Forests, on return from privilege leave is re-posted to the Sunderbans Forest Division as an attached officer.

23rd August 1912.—No. 15.—Babu Jatindra Nath Bose, Probationary Extra Assistant Conservator of Forests, attached to the Sunderbans Forest Division, is granted privilege leave for one month, with effect from the 6th September 1912.

5.—Assam Gazette.

8th August 1912.—No. 1649R.—Mr. Gyanada Charan Sen, Extra Assistant Conservator of Forests, in charge of the Garo Hills Forest Division, is allowed privilege leave for three months, under article 260 of the Civil Service Regulations, with effect from the 10th August 1912, or any subsequent date on which he may avail himself of it.

9th August 1912.—No. 1661R.—Mr. G. N. Simeon, Assistant Conservator of Forests, attached to the Goalpara Forest Division, is appointed temporarily to hold charge of the Garo Hills Forest Division during the absence on leave of Mr. Gyanada Charan Sen.

15th August 1912.—No. 1744R.—Mr. Tara Kishore Gupta, Extra Assistant Conservator of Forests, attached to the Cachar Forest Division, was appointed to hold charge of that division from the 31st March to the 8th April 1912, both days inclusive.

6.—Bihar and Orissa Gazette.

8th August 1912.—No. 5 (Forests).—An extension of privilege leave for one day is granted to Mr. O. A. Dodsworth, Probationary Extra Assistant Conservator of Forests, in continuation of the leave granted him in Notification No. 1 (Forests), dated the 28th May 1912.

7.—United Provinces Gazette.

27th July 1912.—No. 10.—Babu Ram Sarup, Extra Assistant Conservator of Forests, attached to the Ramnagar Forest Division of the Western Circle, privilege leave for 19 days, with effect from the 10th May 1912.

Transfer.

2nd August 1912.—No. 11.—Mr. H. B. Gawke, Extra Assistant Conservator of Forests, attached to the Kheri Forest Division of the Eastern Circle, to the Naini Tal Forest Division of the Western Circle, as an attached officer, with effect from 25th August 1912.

5th August 1912.—No. 12.—Babu Birbal, Extra Assistant Conservator of Forests, attached to the Chakrata Forest Division of the Western Circle, on return from leave, to the Kheri Forest Division of the Eastern Circle, as an attached officer.

7th August 1912.—No. 13.—Mr. R. G. Marriott, Assistant Conservator of Forests, attached to the Naini Tal Forest Division of the Western Circle, to the Direction Division of the same Circle, as an attached officer, with effect from the 1st August 1912.

Leave.

20th August 1912.—No. 14.—Pandit Shambhu Datt Joshi, officiating Extra Assistant Conservator of Forests, attached to the Chakrata Forest Division of the Western Circle, privilege leave for 1½ months with effect from the 19th August 1912.

8.—Punjab Gazette.

16th August 1912.—No. 479.—*Appointment.*—Chaudhri Muhammad Said, B.A., is appointed probationary Extra Assistant Conservator of Forests on Rs. 150 per mensem with effect from 1st July 1912, and is posted to the Chenab Division as attached officer

9.—Central Provinces Gazette.

19*th August* 1912.—No. 20.—On relief by Mr. G. M. Townshend, Deputy Conservator of Forests, of the charge of the Buldana Forest Division, Mr. Pandurang Narayan, Extra Assistant Conservator of Forests, will remain attached to that Division.

10.—Burma Gazette.

24*th July* 1912.—No. 16.—With reference to Revenue Forest) Department Notification No. 93, dated the 28th June 1912, Mr. G. E. S. Cubitt, Deputy Conservator of Forests, made over, and Mr. E. V. Ellis, Deputy Conservator of Forests, received, charge of the post of Personal Assistant to the Conservator of Forests, Pegu Circle, on the afternoon of the 22nd July 1912.

No. 17.—With reference to Revenue (Forest) Department Notification No. 89, dated the 25th June 1912, Mr. T. W. Forster, Extra Deputy Conservator of Forests, availed himself of the three months' privilege leave granted him on the afternoon of the 19th July 1912.

No. 18.—With reference to Revenue (Forest) Department Notification No. 102, dated the 4th July 1912, Mr. C. S. Baldwin, Probationary Extra Assistant Conservator of Forests, assumed charge of his duties in the Tharrawaddy Forest Division on the forenoon of the 17th July 1912.

No. 19.—With reference to Revenue (Forest) Department Notification No. 99, dated the 4th July 1912, Mr. G. M. Turner, Probationary Extra Assistant Conservator of Forests, assumed charge of his duties in the Prome Forest Division, on the forenoon of the 16th July 1912.

30*th July* 1912.—No. 17.—With reference to Revenue (Forest) Department Notification No. 97, dated the 2nd July 1912, Mr. D. J. Monro, Probationary Extra Assistant Conservator of Forests, assumed charge of his duties in the Yaw Forest Division, on the afternoon of the 4th July 1912.

1*st August* 1912.—No. 119.—On return from leave Mr. J. G. F. Marshall, Extra Assistant Conservator of Forests, is re-posted to duty in the Toungoo Forest Division.

1*st August* 1912.—No. 18.—With reference to Revenue (Forest) Department Notification No. 82, dated the 13th June 1912, Mr. J. G. F. Marshall, Extra Assistant Conservator of Forests, assumed charge of his duties in the Toungoo Forest Division, on the forenoon of the 29th July 1912.

2*nd August* 1912.—No. 124.—Under the provisions of Articles 233 and 338 of the Civil Service Regulations, an extension of furlough on medical certificate for three months is granted to Mr. J. W. Ryan, Extra Deputy Conservator of Forests, in continuation of the leave granted to him in this department Notification No. 106 of the 10th June 1910.

No. 125.—Under the provisions of article 336 of the Civil Service Regulations, an extension of leave on medical certificate for 24 days is granted to Mr. F. A. Reich, Extra Assistant Conservator of Forests, in continuation of the leave granted to him in this department Notification No. 49 of the 25th April 1912.

5*th August* 1912.—No. 16.—With reference to Revenue (Forest) Department Notification No. 101, dated the 4th July 1912, Mr. C. F. L. Mapp, Probationary Extra Assistant Conservator of Forests, reported himself for duty in the Upper Chindwin Forest Division, on the afternoon of the 22nd July 1912, and assumed charge of his duties at Kindat on the same date.

7*th August* 1912.—No. 126.—On return from leave Mr. F. A. Reich, Extra Assistant Conservator of Forests, is posted to duty in the Pyinmana Forest Division.

8*th August* 1912.—No 127.—With reference to this department Notification No. 93 of the 28th June 1912, Mr. E. V. Ellis, Deputy Conservator of Forests, was placed on special duty in the office of the Conservator of Forests, Pegu Circle, from the 15th to the 22nd July 1912.

20*th August* 1912.—No. 18.—With reference to Revenue (Forest) Department Notification No. 127, dated the 7th August 1912, Mr. F. A. Reich, Extra Assistant Conservator of Forests, entered upon his duties in the Pyinmana Forest Division, on the forenoon of the 10th August 1912.

20th August 1912.—No. 21.—With reference to Revenue (Forest) Department Notification No. 126, dated the 8th August 1912, Mr E. V. Ellis, Deputy Conservator of Forests, relinquished charge of his duties as Working Plans Officer in Tharrawaddy on the forenoon of the 15th July 1912, and assumed charge of the special duty in the office of the Conservator of Forests, Pegu Circle, with effect from the same date.

TIMBER AND PRODUCE RATES.

C. LEARY & CO.'S LONDON MARKET REPORT.

1st to 31st July 1912.

EAST INDIA TEAK.—*Timber.*—The tone continues dull, but there is no easing off in prices for Burma or Siam wood, available supplies being on a very small scale. Java is in occasional request. *Planks.*—Values for the older descriptions are firm with an upward tendency, though the business passing is only moderate. Java is not in great request. Quotations are: Timber, £14 to £25 (Java £7 to £20); Flitches, £16 to £24 (Hewn Java £10 to £17); Planks, £14 to £25 (Java £12 to £16); all per load on c.i.f. terms. The arrivals of Timber were 150 loads from Burma and 73 loads from Java. The analysis of deliveries and stocks is as follows:—

	Deliveries for July. Loads.		Deliveries to 31st July. Loads.		Dock Stock. Loads.	
	Timber.	Planks.	Timber.	Planks.	Timber.	Planks.
1912 ...	176	322	2,460	2,145	2,503	3,463
1911 ...	96	292	1,624	1,983	3,862	3,541
1910 ...	152	204	2,171	2,027	1,622	3,025

PADOUK.—Shipments cannot be encouraged at present.

PENCIL CEDAR.—There is a good outlet for sizeable logs of good quality; values are about 3*s.* per foot cube, calliper measure.

SATINWOOD.—East India.—Stocks are heavy, whilst the demand is restricted. Quotations in parcel are 6*d.* to 1*s.* 6*d.*

ROSEWOOD.—East India.—Medium and large logs of good quality can be advised, but there is little enquiry for inferior wood; we quote £7 to £15 per ton.

EBONY.—Ceylon.—Only small quantities of good quality are required. East India.—Limited parcels of prime logs would obtain fair rates. Quotations are:—Ceylon, £7 to £15 per ton; East India, £6 to £12.

MARKET RATES FOR FOREST PRODUCTS.

Name of Product.	Quotations, English or Indian.	Rates for July 1912.	Rates for August 1912.
Cardamoms ...	English, per lb.	3*s.* 7*d.* to 5*s.* 8*d.*	3*s.* 7*d.* to 5*s.* 8*d.*
Croton Seeds ...	,, ,, cwt.	70*s.* to 75*s.*	70*s.* to 80*s.*
Cutch ...	,, ,, ,,	29*s.* to 37*s.* 6*d.*	29*s.* to 37*s.* 6*d.*
,, (Tablets) ...	Burma, ,, ,,	Rs. 56 to Rs. 60.	Rs. 54 to 57-8.
Gum Arabic—			
Karachi ...	English, ,, Cwt.	27*s.* 6*d.* to 35*s.*	27*s.* 6*d.* to 35*s.*
Madras ...	,, ,, ,,	do.	do.
Gum, Kino ...	,, ,, lb.	6*d.* to 1*s.*	6*d.* to 1*s.*
Myrabolans—			
Bengal ...	,, ,, cwt.	4*s.* to 5*s.*	4*s.* to 5*s.*
Bombay ...	,, ,, ,,	4*s.* 6*d.* to 7*s.* 3*d.*	4*s.* 6*d.* to 7*s.* 3*d.*
Madras ...	,, ,, ,,	4*s.* 9*d.* to 5*s.* 6*d.*	4*s.* 9*d.* to 5*s.* 6*d.*
Myrabolans ...	Indian, per B. Md.	Rs. 2-6. to Rs. 2-8	Rs. 2-8.
Nux Vomica—			
Bengal ...	English, per cwt.	8*s.* 6*d.*	8*s.* 6*d.*
Madras ...	,, ,, ,,	8*s.* 6*d.* to 9*s.*	8*s.* 6*d.* to 9*d.*
Cochin ...	,, ,, ,,	9*s.* 6*d.* to 12*s.* 6*d.*	9*s.* 6*d.* to 12*s.* 6*d.*
Nux Vomica ...	Indian, per B. Md.	...	Rs. 2-12 to Rs. 3-4.
Oil, Lemon Grass ...	English, per oz.	(Not quoted.)	4¾*d.*
,, Rosha Grass ...	Indian ,, lb.	(Season closed.)	(Season closed).
,, Sandalwood ...	English ,, lb.	11*s.* 6*d.*	12*s.*
Rosin ...	,, ,, cwt.	15*s.* 9*d.* to 16*s.* 3*d.*	16*s.* 4½*d.* to 16*s.* 6*d.*
,, ...	Indian Cal. ,, ,,	Rs. 16-8 to Rs. 17.	Rs. 16-8 to Rs. 17.
,,	,, Bomby. ,, ,,	...	...
Turpentine ...	English, per Gal.	2*s.* 8½*d.*	2*s.* 5*d.* to 2*s* 6½*d.*
,, Bombay ...	Indian, ,, ,,	...	Rs. 3 to Rs. 3-1-7.
,, Calcutta ...	,, ,, ,,	...	...
Rubber, India—			
Assam ...	Indian per B. Md.	Rs. 50 to Rs. 160.	Rs. 60 to Rs. 140.
,, ...	English ,, lb.	3*s.* 4*d.* to 4*s.*	3*s.* 4*d.* to 3*s.* 11*d.*
Burma (Rangoon) ...	,, ,, ,,	2*s.* to 3*s.*	2*s.* to 3*s.*
Rubber, Para ...	,, ,, ,,	4*s.* 2¾*d.* to 5*s.* 0½*d.*	4*s.* 5*d.* to 5*s.* 2*d.*
Seed-lac ...	,, ,, cwt.	45*s.* to 60*s.*	45*s.* to 60*s.*
Shellac, T. N. Diamond	Indian, per B. Md.	Rs. 29-12 to Rs. 30-4	Rs. 29-4 to Rs. 31.
,, T. N. Orange	English, ,, cwt.	62*s.*	62*s.* to 64*s.*
Tamarinds—			
Calcutta ...	,, ,, ,,	9*s.* to 12*s.*	9*s.* to 12*s.*
Madras ...	,, ,, ,,	4*s.* to 5*s.*	4*s.* to 5*s.*
Tamarinds ...	Indian, per B. Md	...	Rs. 1-6. to Rs. 4-4.
Teak (Selected Indian, 1st class).	,, ,, ton of 50 c.ft.	Rs. 115 to Rs. 135	Rs. 125 to Rs. 140.

Note.—(1) B. Md. indicates Bengal Maund, which is equal to 80 lbs.
(2) T. N. Diamond and T. N. Orange are commercial terms applied to certain grades of shellac.

LIST OF BOOKS AND PUBLICATIONS RECEIVED BY HONORARY EDITOR DURING AUGUST 1912.

Bulletin Bibliographique Hebdomadaire, Nos. 23, 24, 25, 26, 27 and 28 of 8th, 15th, 22nd and 29th June and 6th and 13th July 1912.

The Tropical Agriculturist for July 1912.

American Forestry for July 1912.

The Indian Trade Journal for August 1st, 8th, 15th and 22nd.

Budget Estimate of the Cochin State for 1088 M. E.

Progress Report of Forest Administration in the Province of Eastern Bengal and Assam for 1910-11.

Federated Malay States Forest Administration Report for the year 1911.

Indian Field for August 1st, 8th, 15th and 22nd.

Biltmore Doings for June and July 1912.

Lewis and Peat's Monthly Prices Current for 17th July 1912.

Quarterly Journal of Forestry for July 1912.

Revue des Eaux et Forets Nos. 14 and 15 for July 15th and August 1st, 1912.

Indian Engineering for August 3rd, 10th, 17th and 24th.

The Agricultural Journal of India for July 1912.

Commercial America for July 1912.

Bulletin Economique de L'Indochine No. 96 for May-June 1912.

Bulletin of the Bureau of Agricultural Intelligence and of Plant-Diseases No. 7 for July 1912.

Forest Products of Canada, 1911, Pulpwood.

The Indian and Eastern Engineer for August 1912.

Proceedings and Journal of the Agricultural and Horticultural Society of India for July-December 1911.

India Rubber World for 1st August 1912.

Review by the Chief Minister, Jammu and Kashmir State, on the Forest Administration Report for the year Sambat 1966.

U. S. Department of Agriculture Experiment Station Record, Vol. XXVI, No. 8, for June 1912.

The Scottish Geographical Magazine for August 1912.

Identification of the Economic Woods of the United States, by Samual J. Record, M.A., M.F.

Denny, Mott and Dickson's Wood Market Report for 1st August 1912.

The Forest Flora of New South Wales, Vol. V, Part 8

Printed at the Pioneer Press by GEO. SIM, No. 1233—15-10-12.

GAZETTE NOTIFICATIONS.

1.—Gazette of India.

Forests.

25th September 1912.—No. 782—272-13-F.—Mr. G. E. S. Cubitt, Assistant Inspector-General of Forests, is granted privilege leave for 27 days combined with furlough on medical certificate for five months and three days, with effect from the 19th September 1912.

From the same date Mr. R. S. Troup, Sylviculturist at the Forest Research Institute and College, Dehra Dun, is appointed to officiate as Assistant Inspector-General of Forests, in addition to his present duties until further orders.

27th September 1912.—No. 797—266-4-F.—Consequent on the grant of privilege leave for one month to Mr. P. H. Clutterbuck, Officiating Conservator of Forests, 3rd grade, Eastern Circle, United Provinces, Mr. B. B. Osmaston, Conservator of Forests, Western Circle, United Provinces, is appointed to hold charge of the Eastern Circle, in addition to his own duties, with effect from the afternoon of 15th September 1912, the date on which Mr. Clutterbuck made over charge of his office.

2.—Madras Gazette.

20th August 1912.—No. 363.—The following posting of a Forest Officer is ordered :—

Mr. R. Ry. K. Gajaraja Mudaliyar, Extra Assistant Conservator of Forests, to act as District Forest Officer, North Salem, until further orders. To join forthwith.

22nd August 1912.—No. 360.—The Right Honourable the Secretary of State for India has been pleased to permit Mr. C. D. McCarthy, Deputy Conservator of Forests, to return to duty.

6th September 1912.—No. 374.—The Government sanction the grant to K. Syed Edullah Sahib Bahadur, Extra Assistant Conservator of Forests, of an extension of privilege leave for twenty-nine days in continuation of the privilege leave of one month already granted to him by the Board of Revenue.

6th September 1912.—No. 376.—The following posting of a Forest Officer is ordered :—

Mr. Cecil Claude Wilson, Assistant Conservator of Forests, to act as District Forest Officer, North Salem Division. To join on relief by Mr. A. Wimbush.

3.—Bombay Gazette.

Central Circle.

29th August 1912.—No. 2327.—Messrs. G. R. Duxbury and C. E. L. Gilbert, Deputy Conservators of Forests, respectively delivered over and received charge of the South Nasik Division on the afternoon of the 16th of August 1912.

Southern Circle.

5th September 1912.—No. 3566.—Mr. G. S. Butterworth, Assistant Conservator of Forests, delivered over charge of the Kanara Southern Division to Mr. P. E. Aitchison, Deputy Conservator of Forests and Divisional Forest Officer, Working Plans, S. C., on the afternoon of the 30th August 1912, and proceeded on leave granted in Government Notification No. 6878 of 26th July 1912.

10th September 1912.—No. 8472.—Mr. L. S. Osmaston, Conservator of Forests, has been allowed by His Majesty's Secretary of State for India an extension of furlough for two months.

20th September 1912.—No. 8677.—Mr. Shriniwas Balajirao Bendigiri, Extra Assistant Conservator or Forests and Sub-Divisional Forest Officer, Central Thana, is granted privilege leave of absence for three months with effect from 20th November 1912 or the subsequent date on which he may be relieved.

4.—BENGAL GAZETTE.

Nil.

5.—ASSAM GAZETTE.

6th September 1912.—No. 2004R.—Mr. D. P. Copeland, Deputy Conservator of Forests, who was recalled to duty from the privilege leave granted to him in Notification No. 1197R., dated the 10th July 1912, was attached to the Direction Division from the 14th to the 26th August 1912, both days inclusive.

6th September 1912.—No. 2005R.—The following Notification by the Government of India in the Department of Revenue and Agriculture is republished :—

No. 682-F.—110-5, *dated the 29th August* 1912.—With reference to this Department No. 394-F.—110-4, dated the 20th June 1912, the following promotions are made with effect from the 20th August 1912, the date from which the furlough of Mr. E. S. Carr, Conservator of Forests, 1st grade, commences and until further orders :—

* * * * *

Mr. A. V. Monro, Conservator of Forests, 3rd grade, to officiate as Conservator of Forests, 2nd grade.

20th September 1912.—No. 2162R.—Mr. Ramnath Mukharji, Extra Assistant Conservator of Forests, attached to the Goalpara Forest Division, is deputed to hold charge of the Provincial Forest Training Class, Assam, for six months, with effect from the 15th October 1912.

23rd September 1912.—2191-R.—Mr. D. P. Copeland, Deputy Conservator of Forests, temporarily attached to the Direction Division, is allowed privilege leave for two months and nineteen days, under articles 199 (*a*). 260 and 301 of the Civil Service Regulations, with effect from the 27th August 1912.

6.—BIHAR AND ORISSA GAZETTE.

20th August 1912.—No. 6 (Forests).—Privilege leave for three months is granted to Mr. R. G. A. Hannah, Extra Deputy Conservator of Forests, with effect from the 5th September 1912.

Mr. G. M. Cooper, Assistant Conservator of Forests, attached to the Direction Division, is appointed to hold charge of the Puri Forest Division, during the absence on leave of Mr. R. G. A. Hannah, or until further orders.

27th August 1912.—No. 3142R (B)—Mr. A. N. Grieve, Assistant Conservator of Forests, is granted combined leave for nine months, *viz.*, privilege leave for twenty-two days under article 260 of the Civil Service Regulations and furlough on medical certificate for the remaining period under articles 308 *a)* and 233 of the Regulations, with effect from the date on which he availed himself of it.

7.—UNITED PROVINCES GAZETTE.

26th August 1912.—No. 644—228-4-F.—Dr. A. D. Imms, Forest Zoologist at the Forest Research Institute and College, Dehra Dun, on probation, is confirmed in his appointment, with effect from the 30th October 1912.

4th September 1912.—No. 15.—Mr. F. F. R. Channer, Special Forest Officer, Tarai and Bhabar Government Estates Forests, to the charge of the Kumaun district protected forests, from the 2nd September 1912.

No. 16.—Mr. H. C. Ross, Extra Assistant Conservator of Forests, attached to the Haldwani Forest Division of the Eastern Circle to the charge of the Tarai and Bhabar Government Estates, Forests from the 3rd September 1912, or later date.

12*th September* 1912.—No. 4320—II-432.—Mr. P. H. Clutterbuck, Officiating Conservator of Forests, Eastern Circle, privilege leave for one month, from the 16th September 1912.

21*st September* 1912.—No. 4471—II/570.—Pandit Shambhu Datt Joshi, officiating Extra Assistant Conservator of Forests, reverted to his substantive appointment as Forest Ranger, with effect from the 30th August 1912.

25*th September* 1912.—No. 4534—II/484.—The services of Mr. H. G. Billson, Deputy Conservator of Forests, in charge of the Siwalik Forest Division of the Western Circle, are placed at the disposal of the Government of India, Department of Revenue and Agriculture, with effect from the date on which he relinquishes charge of his present duties.

25*th September* 1912.—No. 4535—II/484.—Mr R. C. Milward, Deputy Conservator of Forests, in charge of the Chakrata Forest Division of the Western Circle, to hold charge of the Siwalik Forest Division of the same circle, in addition to his other duties, *vice* Mr. H. G. Billson.

8.—Punjab Gazette.

30*th August* 1912.—No. 503—*Notification.*—Babu J. N. Mukerji, Extra Assistant Conservator of Forests, and Mr. B. M. Warde, Probationary Extra Assistant Conservator of Forests, respectively made over and received charge of the Jhelum Forest Division on the afternoon of 13th August 1912, consequent on the former's departure on 3 months' privilege leave.

3*rd September* 1912.—No. 508.—*Notification.*—Pandit Gokal Das, Extra Deputy Conservator of Forests, and Lala Sundar Das, Extra Assistant Conservator of Forests, respectively made over and received charge of the Lahore Forest Division on the afternoon of the 15th August 1912, consequent on the former's departure on six weeks' privilege leave.

9.—Central Provinces Gazette.

2*nd September* 1912.—No. 24.—Mr. E. Hore, Probationary Extra Assistant Conservator of Forests, is posted to the charge of the Dhamtari Range in the Raipur Forest Division.

9*th September* 1912.—No. 27.—Mr. Nazir Abbas, Probationary Extra Assistant Conservator of Forests, attached to the Hoshangabad Forest Division, is granted privilege leave for three months, with effect from the 8th September 1912, or such subsequent date as he may avail himself of it.

10.—Burma Gazette.

21*st August* 1912.—No. 132.—Mr. V. H. T. Fields-Clarke, Assistant Conservator of Forests, is transferred from the Upper Chindwin Forest Division and is posted to the Yaw Forest Division for special duty in connection with measuring timber.

No. 133.—Mr. J. W. Bradley, Assistant Conservator of Forests, is transferred from the Katha Forest Division and is posted to the Yaw Forest Division for special duty in connection with measuring timber.

No. 134.—Mr. A. R. Villar, Assistant Conservator of Forests, is transferred from the Zigôn Forest Division and is posted to the Yaw Forest Division for special duty in connection with measuring timber.

No. 135.—Mr. A. W. Moodie, Assistant Conservator of Forests, is transferred from the Zigôn Forest Division and is posted to the Yaw Forest Division for special duty in connection with measuring timber.

No. 136.—Mr. G. H. Alington, Assistant Conservator of Forests, is transferred from the Pyinmana Forest Division and is posted to the Mandalay Depôt Division for special duty in connection with measuring timber.

No. 137.—Mr. G. C. Cheyne, Assistant Conservator of Forests, is transferred from the Ruby Mines Forest Division and is posted to the Mandalay Depôt Division for special duty in connection with measuring timber.

25th August 1912.—No. 141.—The Lieutenant-Governor directs that Maung Kyaw, Ranger, 1st grade, and Mr A. E. Elmore, Ranger, 2nd grade, shall be promoted to be Extra Assistant Conservators of Forests with effect from the 1st September 1912.

2nd September 1912.—No. 18.—With reference to Revenue (Forest) Department Notification No. 132, dated the 21st August 1912, Mr. V. H. T. Fields-Clarke, Assistant Conservator of Forests, relinquished charge of his duties in the Upper Chindwin Forest Division, on the forenoon of 27th August 1912 and proceeded to Yaw Forest Division on the same rate.

4th September 1912.—No. 147.—The Lieutenant-Governor is pleased to direct that, with effect from the date on which Mr. S. F. Hopewood, Deputy Conservator of Forests, assumes charge of the North Toungoo Forest Division, the area now comprised in the Toungoo Forest Division shall constitute two separate Forest Divisions, namely :—

(1) The North Toungoo Forest Division comprising the Toungoo Subdivision of the Toungoo District.

(2) The South Toungoo Forest Division comprising the Pyu Subdivision of the Toungoo District.

The headquarters of each division shall be in the town of Toungoo.

No. 148.—On completion of the Working Plans duty to which he was posted in this Department Notification No. 12 of the 7th February 1912, Mr. S. F. Hopewood, Deputy Conservator of Forests, is posted to the charge of the newly-constituted North Toungoo Forest Division.

No. 149.—Mr. N. V. Holberton, Deputy Conservator of Forests, is posted to the charge of the newly-constituted South Toungoo Forest Division.

6th September 1912.—No. 150—Under the provisions of article 260 of the Civil Service Regulations, privilege leave for two months and fourteen days is granted to Mr. W. R. French, Extra Assistant Conservator of Forests, in charge of the Magwe Forest Sub-division, Minbu Forest Division, with effect from the 6th September 1912 or the subsequent date on which he may avail himself of it.

No. 151.—Mr. A. J. Walsh, Probationary Extra Assistant Conservator of Forests, attached to the Minbu Forest Division, is posted to the charge of the Magwe Forest Subdivision, Minbu Forest Division, in place of Mr. W. R. French, Extra Assistant Conservator of Forests, proceeding on leave.

No. 152.—The headquarters of Mr. F. E. C. Palmer, Probationary Extra Assistant Conservator of Forests, who was posted to duty in the Henzada-Ma-ubin Forest Division in this Department Notification No. 114 of the 30th June 1911, are at Myanaung, with effect from the 19th October 1911.

No. 153.—Mr. P. E. Plunkett, Extra Assistant Conservator of Forests, on relinquishing charge of his duties as Assistant Superintendent of Kheddahs in the Kheddah Department, is transferred from Katha and is posted to duty in the Zigôn Forest Division.

8th September 1912.—No. 154.—Mr. G. K. Murphy, Probationary Extra Assistant Conservator of Forests, attached to the Thayetmyo Forest Division, is transferred from Thayetmyo and is posted to duty in the Zigôn Forest Division with headquarters at Zigôn, with effect from the 24th July 1912.

10th September 1912.—No. 19.—With reference to Revenue (Forest) Department Notifications Nos. 132 and 134, dated the 21st August 1912, Messrs. V. H. T. Fields-Clarke and A. R. Villar, Assistant Conservators of Forests, assumed charge of their timber measuring duties in the Yaw Forest Division, on the forenoon of the 3rd September 1912.

10th September 1912.—No. 5.—Mr. P. E. Plunkett, Extra Assistant Conservator of Forests, relinquished charge of his duties as Assistant Superintendent of Kheddahs on the afternoon of the 6th September 1912.

TIMBER AND PRODUCE RATES.

C. LEARY & CO.'S LONDON MARKET REPORT.

1st to 31st August 1912.

EAST INDIA TEAK.—*Timber.*—Burma and Siam wood continues in scanty supply, and were it not that the enquiry also still continues dull, prices would probably advance materially; even as it is, they are decidedly firm with an upward tendency. Java is seldom enquired for. *Planks.*—Only a moderate trade is being done, but values for both Burmah and Siam are very firm. For hewn Java there is only an occasional demand, though sawn, if obtainable at reasonable rates, would sell readily. The arrivals of Timber were 394 loads from Burmah, 150 loads from Bangkok and 142 loads from Java. Quotations are: Timber, £14 to £25 (Java £7 to £20); Flitches, £16 to £24 (Hewn Java £10 to £17); Planks, £14 to £25; Java £12 to £16); all per load on c. i. f. terms. The analysis of deliveries and stocks is as follows:—

	Deliveries for August. Loads.		Deliveries to 31st August. Loads.		Dock Stock. Loads.	
	Timber.	*Planks.*	*Timber.*	*Planks.*	*Timber*	*Planks.*
1912 ...	536	663	2,996	2,808	2,199	2,918
1911 ...	151	348	1,775	2,331	3,765	3,464
1910 ...	159	210	2,330	2,237	1,694	3,031

PADOUK.—There is little enquiry.

PENCIL, CEDAR.—Clean logs of good dimensions would be well received; values are about 3*s.* per foot cube, calliper measure.

SATINWOOD.—East India.—Finely-figured logs are in good request at fair prices, but the demand for plain wood is quiet. Quotations in parcel are 6*d.* to 1*s.* 6*d.*

ROSEWOOD.—East India.—Stocks have been considerably increased and shipments should be confined to prime large logs; we quote £7 to £15 per ton.

EBONY.—Ceylon.—There is a limited outlet for large logs of good character. East India.—Consignments of well-selected timber can be advised. Quotations are:—Ceylon £7 to £15 per ton, East India £6 to £12.

MARKET RATES FOR FOREST PRODUCTS.

Name of Product.	Quotations, English or Indian.	Rates for August 1912.	Rates for September 1912.
Cardamoms ...	English, per lb.	3*s* 7*d*. to 5*s* 8*d*	Information not available
Croton Seeds ...	,, ,, cwt	70*s*. to 80*s*.	
Cutch ...	,, ,, ,,	29*s*. to 37*s*. 6*d*	29*s*. to 35*s*.
,, (Tablets) ...	Burma ,, ,,	Rs. 54 to Rs. 57 8.	Rs. 53 to Rs. 55.
Gum, Arabic—			
Karachi ...	English ,, ,,	27*s*. 6*d*. to 35*s*.	
Madras ...	,, ,, ,,	27*s*. 6*d*. to 35*s*.	
Gum, Kino ...	,, ,, lb.	6*d*. to 1*s*.	
Myrabolans—			
Bengal ...	,, ,, cwt.	4*s* to 5*s*.	
Bombay ...	,, ,, ,,	4*s*. 6*d*. to 7*s*. 3*d*.	Information not available.
Madras ...	,, ,, ,,	4*s* 9*d*. to 5*s*. 6*d*.	
Myrabolans ...	Indian, per B. Md.	Rs. 2-8.	
Nux Vomica –			
Bengal ...	English, per cwt.	8*s*. 6*d*.	
Madras ...	,, ,, ,,	8*s*. 6*d*. to 9*s*.	
Cochin ...	,, ,, ,,	9*s*. 6*d*. to 12*s* 6*d*	
Nux Vomica ...	Indian, per B Md	Rs. 2 12 to Rs. 3-4	Rs. 2-14 to Rs. 3-6.
Oil, Lemon Grass ...	Indian, per oz.	$4\frac{3}{4}d$.	(Not quoted.)
,, Rosha Grass ...	,, ,, seer	Season closed.	Season closed.
,, Sandalwood ...	English ,, lb.	12*s*	(Not quoted.)
Rosin ...	,, ,, cwt.	16*s*. $4\frac{1}{2}d$. to 16*s*. 6*d*.	16*s*. $4\frac{1}{2}d$. to 16*s* 9*d*.
,, Calcutta ...	Indian ,, ,,	Rs. 16-8 to Rs. 17.	Rs. 15-8 to Rs. 16.
,, Bombay ...	,, ,, ,,	...	Rs 13-8 to Rs 14-4
Turpentine ...	English, ,, gall.	2*s*. 5*d*. to 2*s*. $6\frac{1}{2}d$.	2*s*. 4*d* to 2*s*. 5*d*.
,, Bombay .	Indian ,, ,,	Rs. 3 to Rs. 3-1-7.	Rs. 3-2-9 to 3-4-4.
,, Calcutta ..	,, ,, ,,	..	...
Rubber, India—			
Assam ...	Indian, per B. Md.	Rs. 60 to Rs. 140.	Rs. 60 to Rs 140.
,, ...	English, per lb.	3*s*. 4*d*. to 3*s*. 11*d*.	Information not available.
Burma ...	,, ,, ,,	2*s*. to 3*s*.	
Rubber, Para ...	,, ,, ,,	4*s*. 5*d*. to 5*s*. 2*d*.	4*s*. $5\frac{3}{4}d$ to 5*s*.
Seed-lac ...	,, ,, cwt.	45*s*. to 60*s*.	
Shellac, T.N Diamond	Indian, per B. Md.	Rs. 29-4 to Rs. 31.	Rs. 31-8 to Rs. 33
,, T.N. Orange	English per cwt.	62*s*. to 64*s*.	65*s*. to 68*s*.
Tamarinds—			
Calcutta ...	Indian ,, ,,	Rs. 1-6 to Rs. 4-4.	Rs. 1-6 to Rs 4-4.
Madras ...	English ,, ,,	9*s*. to Rs. 12*s*.	Information not available.
Tamarinds ...	,, ,, ,,	4*s*. to 5*s*.	
Teak (Selected Indian, 1st class).	Indian, per ton of 50 c.ft.	Rs. 125 to Rs. 140.	Rs. 125 to Rs. 140.

Note.—(1) B. Md. indicates Bengal Maund, which is equal to 80 lbs.

(2) T. N. in Diamond and T. N. Orange are commercial terms applied to certain grades of shellac.

LIST OF BOOKS AND PUBLICATIONS RECEIVED BY HONORARY EDITOR DURING SEPTEMBER 1912.

American Forestry for August 1912.

The Indian Trade Journal for August 29th, and September 5th, 12th, 19th and 26th.

Indian Field for August 29th, and September 5th, 12th, 19th and 26th.

Indian Engineering for August 31st and September 7th, 14th and 21st.

Report on the Forest Resources of the Abor Country, by A. J. W. Milroy, I.F.S.

The Tropical Agriculturist for August 1912.

Revue des Eaux et Forêts No. 16 for August 1912.

The Ceylon Commercial Monthly for July and August 1912

Reports on the Finance Administration and Condition of the Soudan, 1911, Vols. I and II.

Annual Report of the Committee of the Nilgiri Game Association for the year ending 30th June 1912, Ootacamund.

Canadian Forestry Journal for July-August 1912

International Institute of Agriculture, Bulletin No. 8 of the Bureau of Agricultural Intelligence and of Plant-diseases, August 1912.

Bulletin Bibliographique Hebdomadaire Nos. 29, 30, 31 and 32 for July and August 1912.

The Forest Flora of New South Wales, Vol. V, Pt. 9

Memoirs of the Department of Agriculture in India ; The Milk of some breeds of Indian Cows and Buffaloes ; A Contribution to the knowledge of the black cotton soils of India, Vol. II, Nos. 4 and 5 ; The Morphology and Parasitism of Rhizoctonia, Vol. IV, No. 6.

The Census of India, 1911, Vol. XVIII, Cochin.

The Indian and Eastern Engineer for September 1912

Records of the Geological Survey of India, Vol. XLII, Part. 2.

India Rubber World for 1st September 1912.

Thirteenth Annual Report of the Canadian Forestry Association for 1912.

Denny, Mott and Dickson's Wood Market Report for September 1912

University of California Publications Bulletin No. 226, The Purple Scale ; Bulletin tin No. 227, Grape Vinegar ; and Bulletin No. 228, Pear Thrips and Peach Tree Borer.

Printed at the Pioneer Press by GEO. SIM, No. 1358—1-11-12.

GAZETTE NOTIFICATIONS.

1.—Gazette of India.

10*th October*, 1912.—No. 836—272-19-F.—Mr. H. G. Billson, Deputy Conservator of Forests, United Provinces, relieved Mr. R. S. Troup of the additional charge of the Office of Assistant Inspector-General of Forests, with effect from the afternoon of 4th October 1912, from which date he is appointed to officiate as Assistant Inspector-General of Forests.

Mr. R. S. Troup on relief reverted to his substantive post of Sylviculturist at the Forest Research Institute and College, Dehra Dun.

17*th October*—1912.—No. 852-F.-449-9.—Mr. Ghanshyam Prasad, Extra Assistant Conservator of Forests, Central Provinces, is appointed to be an Assistant Instructor on the staff of the Forest College, Dehra Dun, with effect from the forenoon of the 1st October 1912, in place of Rai Keshavanand, Bahadur.

From the same date Rai Keshavanand, Bahadur, Extra Deputy Consevator of Forests, reverted to his substantive appointment on the United Provinces cadre.

24*th October* 1912.—No. 884—266-7-F.—On return from privilege leave Mr. P. H. Clutterbuck, Officiating Conservator of Forests (3rd grade), resumed charge of the Office of Conservator of Forests, Eastern Circle, United Provinces, with effect from the afternoon of the 15th October 1912, the date on which he relieved Mr. B. B. Osmaston, Conservator of Forests, Western Circle, United Provinces, of the additional charge of that post.

2.—Madras Gazette.

2nd October 1912.—No. 407.—Mr. G. H. Welchman, Special Forest Officer, Parlakimedi Maliahs, is granted one day's extension of privilege leave in continuation of the privilege leave for one month already granted to him by the Board of Revenue.

5*th October* 1912.—No. 409.—The following postings of Forest Officers are ordered:—

Mr. Charles D'Arcy McArthy, Deputy Conservator of Forests, to be District Forest Officer, North Salem.

Mr. Cecil Claude Wilson, Assistant Conservator of Forests, to be District Forest Officer, South Vellore.

Mr. Charles Joseph Wouterz, Extra Deputy Conservator of Forests, to be District Forest Officer, Guntur.

Mr. Bernard Francis Rigold, Deputy Conservator of Forests, to be District Forest Officer, Chingleput.

Mr. Alfred Alyson Fennel Minchin, Assistant Conservator of Forests, to be District Forest Officer, East Kurnool, on relief by Mr. B. H. Barlow-Poole.

7*th October* 1912.—*Leave.*—Under article 260 of the Civil Service Regulations, the Board is pleased to grant one month's privilege leave to Mr. A. A. F. Minchin, Assistant Conservator of Forests, with effect from date of relief by Mr. B. H. Barlow-Poole, Deputy Conservator of Forests.

Leave and appointment.—(1) Ranger Mr. Omen, in charge of Atmakur Range, Kurnool West, is granted privilege leave for two months and thirteen days with effect from date of relief.

(2) Assistant Conservator Mr. Madan will be in charge of Atmakur Range, *vice* No. (1) on leave, 6th October 1912.

8*th October* 1912.—No. 416.—Under articles 260, 233 and 338 of the Civil Service Regulations, M. R. Ry. K. Aswatham Nayudu Garu, District Forest Officer, East Kurnool, is granted combined privilege leave for two months and two days and furlough for four months and twenty-eight days in continuation thereof with effect from 1st November 1912.

15*th October* 1912.—No. 428.—Under articles 233 and 338, Civil Service Regulations, Mr. James Tapp, Extra Assistant Conservator of Forests, is granted furlough for one year and nine months in continuation of the privilege leave of three months already granted to him in G. O. Routine No. 407, Revenue, dated 18th May 1912. He will also

be permitted to retire from service on the termination of the furlough, *i.e.*, with effect from 1st August 1914 when he attains the age of 55 years.

3.—Bombay Gazette.

8th October 1912.—No. 9289.—Mr. T. R. D. Bell, Conservator of Forests, Southern Circle, is granted privilege leave for three months in combination with furlough for three months with effect from 15th October 1912, or the subsequent date on which he may be relieved.

14th October 1912.—No. 9502.—His Excellency the Governor in Council is pleased to make the following appointments :—

Mr. W. A. Wallinger, on return from leave, to be Divisional Forest Officer, Satara.

Mr. A. F. Gonsalves, on relief, to be Working Plans Officer, Central Circle.

16th October. 1912—No. 9594.—His Excellency the Governor in Council is pleased to appoint Mr. O. H. L. Napier, on return from leave, to act as Conservator of Forests, Southern Circle, during the absence on leave of Mr. T. R. D. Bell or pending further orders.

18th October 1912.—No. 4406.—Mr. G. S. Butterworth, Assistant Conservator of Forests, Southern Circle, returned from the leave granted in Government Notification No. 6878 of 26th July 1912, and resumed charge of the Kanara Southern Division from Mr. P. E. Aitchison, Deputy Conservator of Forests, Working Plans, on the forenoon of the 5th instant.

4.—Bengal Gazette.

1st October 1912.—No. 16 *For.*—Mr. H. S. Gibson, Assistant Conservator of Forests, on return from leave, is reposted to the charge of the Kurseong Forest Division and the Directorship of the Kurseong Forest School.

No. 17 *For.*—Mr. J. R. P. Gent, Assistant Conservator of Forests, on relief by Mr. H. S. Gibson, Assistant Conservator of Forests, is posted temporarily as an attached officer to the Kurseong Forest Division up to the 31st October 1912, and is then transferred to Buxa Forest Division as an attached officer.

14th October 1912.—No. 2251 *T. R.*—The services of Mr. T. H. Monteath, Deputy Conservator of Forests, on leave, are placed at the disposal of the Government of Bihar and Orissa, from the date on which his leave expires.

5.—Assam Gazette.

16th October 1912.—No. 2506 R.—Mr. F. H. Cavendish, Deputy Conservator of Forests, on return from leave, is attached to the Lakhimpur Forest Division.

6.—Bihar and Orissa Gazette.

1st October 1912.—No. 7 (Forests).—Ten days' privilege leave is granted to Mr. A. P. Mudaliar, Extra Assistant Conservator of Forests, with effect from the 5th October 1912 with the permission to affix the Puja holidays.

8th October 1912.—No. 8 (Forests).—Mr. P. Mudaliar, Extra Assistant Conservator of Forests, made over charge of the Sambalpur Forest Division to Mr. Crawford, I.C.S., Deputy Commissioner, on the afternoon of the 4th October and proceeded on the privilege leave granted to him under Notification No. 7 (Forests), dated the 1st October 1912.

7.—United Provinces Gazette.

3rd October 1912.—No. 4717—II/280.—The services of Mr. J. H. Lyall, Assistant Conservator of Forests, attached to the Chakrata Forest Division of the Western Circle, are placed at the disposal of the Agent to the Governor-General in Rajputana from the 1st November 1912, for a period of three months.

Posting.

30th September 1912.—No. 17.—Mr. J. E. C. Turner, probationary Extra Assistant Conservator of Forests, attached to the Siwalik Forest Division of the Western Circle, to the charge of the Naini Tal district protected forests.

8.—Punjab Gazette.

Nil.

9.—Central Provinces Gazette.

19th September 1912.—No. 30.—Privilege leave for three months, under article 260 of the Civil Service Regulations, is granted to Mr. Faiz Bakhsh, Extra Assistant Conservator of Forests, attached to the Direction Division, Southern Circle, Nagpur, with effect from the 1st October 1912.

27th September 1912.—No. 32.—Mr. Chintaman Vishwanath Sarwate, Extra Assistant Conservator of Forests, attached to the Chhindwara Forest Division, is transferred to the Saugor Forest Division in the same capacity.

17th October 1912.—No. 1884.—On return from the combined leave granted him by Order No. 867, dated the 23rd April 1912, Mr. E. Benskin, Assistant Conservator of Forests, is attached to the Direction Division, Southern Circle.

Order No. 1611, dated the 4th September 1912, is hereby cancelled.

17th October 1912.—No. 852-F.-149-9—Mr. Ghanshyam Prasad, Extra Assistant Conservator of Forests, Central Provinces, is appointed to be an Assistant Instructor on the staff of the Forest College, Dehra Dun, with effect from the forenoon of the 1st October 1912, in place of Rai Keshavanand Bahadur.

10.—Burma Gazette.

19th September 1912.—No. 20.—With reference to Revenue (Forest) Department Notification No. 151, dated the 6th September 1912, Mr. W. R. French, Extra Assistant Conservator of Forests, made over, and Mr. A. J. Walsh, Probationary Extra Assistant Conservator of Forests, received, charge of the Magwe Forest Subdivision on the afternoon of the 8th September 1912, and from the same date and hour the former Officer availed himself of the leave granted him in Revenue (Forest) Department Notification No. 150, dated the 6th September 1912.

23rd September 1912.—No. 20.—With reference to Revenue (Forest) Department Notification No. 148, dated the 4th September 1912, Mr. S. F. Hopwood, Deputy Conservator of Forests, took over charge of the newly constituted North Toungoo Forest Division from Mr. N. V. Holberton, Deputy Conservator of Forests, on the forenoon of the 18th September 1912.

No. 21.—With reference to Revenue (Forest) Department Notification No. 149, dated the 4th September 1912, Mr. N. V. Holberton, Deputy Conservator of Forests, made over charge of the newly constituted North Toungoo Forest Division to Mr. S. F. Hopwood, Deputy Conservator of Forests, on the forenoon of the 18th September 1912, and remains in charge of the newly constituted South Toungoo Forest Division.

23rd September 1912.—No. 23.—With reference to Revenue (Forest) Department Notification No. 153, dated the 6th September 1912, Mr. P. E. Plunkett, Extra Assistant Conservator of Forests, assumed charge of his duties in the Zigôn Forest Division, on the afternoon of the 16th September 1912.

No. 24.—With reference to Revenue (Forest) Department Notification No. 139, dated the 24th August 1912, Mr. G. H. A. Goldberg, Assistant Conservator of Forests, relinquished charge of his duties in the Tharrawaddy Forest Division, on the afternoon of the 13th August 1912, and assumed charge of his special duties in the office of the Conservator of Forests, Pegu Circle, Rangoon, on the 14th August 1912, forenoon.

25th September 1912.—No. 21.—With reference to Revenue (Forest) Department Notification No. 148, dated the 4th September 1912, Mr. S. F. Hopwood, Deputy Conservator of Forests, relinquished charge of the Working Plans duty in the Yaw Forest Division, on the afternoon of the 14th September 1912.

25th September 1912.—No. 782-272-13-F.—Mr. G. E. S. Cubitt, Assistant Inspector-General of Forests, is granted privilege leave for 27 days combined with furlough on medical certificate for five months and three days, with effect from the 19th September 1912.

26th September 1912.—No. 158.—Under the provisions of articles 233, 260 and 308 (*b*) of the Civil Service Regulations, privilege leave to the extent due combined with furlough so as to make up a total period of two years is granted to Mr. J. G. F. Marshall, Extra Assistant Conservator of Forests, on duty in the Toungoo Forest Division, with effect from the date on which he may avail himself of the privilege leave.

No. 20.—With reference to Revenue (Forest) Department Notification No. 133, dated the 21st August 1912, Mr. J. W. Bradley, Assistant Conservator of Forests, relinquished charge of his duties in the Katha Division, on the afternoon of the 21st September 1912, on his transfer to Yaw Division, Pakokku.

27th September 1912.—No. 22.—With reference to Revenue (Forest) Department Notification No. 133, dated the 21st August 1912, Mr. J. W. Bradley, Assistant Conservator of Forests, assumed charge of his timber measuring duties in the Yaw Forest Division, on the forenoon of the 25th September 1912.

3rd October 1912.—No. 23.—With reference to Revenue (Forest) Department Notification No. 135 of the 21st August 1912, Mr. A. W. Moodie, Assistant Conservator of Forests, assumed charge of timber measuring duties in the Yaw Division on the afternoon of the 1st October 1912.

No. 160.—Mr. H. R. Meredith, Assistant Conservator of Forests, is transferred from Toungoo and is posted to the charge of the Shwegyin Forest Division in place of Mr. R. M. Kavanagh, Extra Deputy Conservator of Forests, transferred.

No. 161.—Mr. R. M. Kavanagh, Extra Deputy Conservator of Forests, in charge of the Shwegyin Forest Division, is transferred from Shwegyin and is attached to the Depôt and Agency Forest Division, Rangoon.

4th October 1912.—No. 24.—With reference to Revenue (Forest) Department Notification No. 137 of 21st August 1912, Mr. G. C. Cheyne, Assistant Conservator of Forests, relinquished charge of his duties in the Ruby Mines Division on the afternoon of the 28th September 1912.

No. 25.—With reference to Revenue (Forest) Department Notification No. 136 of 21st August 1912, Mr. G. H. Alington, Assistant Conservator of Forests, relinquished charge of his duties in the Pyinmana Division, on the afternoon of the 28th September 1912.

7th October 1912.—No. 22.—With reference to Revenue (Forest) Department Notification Nos. 136 and 137, dated the 21st August 1912, Mr. G. H. Alington and G. C. Cheyne, Assistant Conservators of Forests, reported themselves for duty in the Depôt Division, Mandalay, on the forenoon of the 30th September 1912 and assumed charge of their duties on the forenoon of the 1st October 1912.

10th October 1912.—No. 27.—With reference to Revenue (Forest) Department Notification No. 135, dated the 21st August 1912, Mr. A. W. Moodie, Assistant Conservator of Forests, relinquished charge of his duties in the Zigôn Forest Division on the afternoon of the 27th September 1912.

No. 28.—With reference to Revenue (Forest) Department Notification No. 154, dated the 21st August 1912, Mr. A. R. Villar, Assistant Conservator of Forests, relinquished charge of his duties in the Zigôn Forest Division on the afternoon of the 30th August 1912.

14th October 1912.—No 22.—With reference to Revenue (Forest) Department Notification No. 158, dated the 26th September 1912, Mr. J. G. F. Marshall, Extra Assistant Conservator of Forests, North Toungoo Forest Division, availed himself of the leave granted him on the 3rd October 1912, before noon.

17th October 1912.—No. 29.—With reference to Revenue (Forest) Department Notification No. 161, dated the 3rd October 1912, Mr. R. M. Kavanagh, Extra Deputy Conservator of Forests, assumed charge of his duties in the office of the Depôt and Agency Division, Rangoon, on the afternoon of the 12th October 1912.

18th October 1912.—No. 175.—Mr. F. A. Leete, Deputy Conservator of Forests, has been granted by His Majesty's Secretary of State for India an extension of furlough for six days in continuation of the combined leave granted to him in this Department Notification No. 40 of the 11th April 1912 as amended by this Department Notification No. 53 of the 30th April 1912.

No. 176.—Mr. F. H. Todd, Deputy Conservator of Forests, has been granted by His Majesty's Secretary of State for India an extension of furlough for five days in continuation of the combined leave granted to him in this Department Notification No. 165 of the 17th October 1911.

21st October 1912.—No. 23.—With reference to Revenue (Forest) Department Notification No. 160, dated the 3rd October 1912, Mr. H. R. Meredith, Assistant Conservator of Forests, relinquished charge of his duties in the Toungoo Forest Division on the forenoon of the 7th October 1912.

No. 30.—With reference to Revenue (Forest) Department Notification No. 110, dated the 18th July 1912, Mr. A. H. M. Barrington, Assistant Conservator of Forests, took over charge of his duties in the Prome Forest Division, with effect from the forenoon of the 3rd August 1912.

23rd October 1912.—No. 177.—On return from leave, Mr. F. W. Collings, Deputy Conservator of Forests, is posted to the charge of the Shwegyin Forest Division in place of Mr. H. R. Meredith, Assistant Conservator of Forests, transferred.

No. 178.—On relief by Mr. F. W. Collings, Deputy Conservator of Forests, Mr. H. R. Meredith, Assistant Conservator of Forests, in charge of the Shwegyin Forest Division, is transferred from Shwegyin and is posted to duty in the Thaungyin Forest Division.

No. 179.—Mr. G. S. Shirley, Assistant Conservator of Forests, attached to the Thaungyin Forest Division, is transferred from Moulmein and is attached to the South Toungoo Forest Division.

No. 180.—Mr. A. B. Nixon, Assistant Conservator of Forests, has been granted by His Majesty's Secretary of State for India an extension of furlough for one month on medical certificate in continuation of the leave notified in this Department Notification, No. 78 of the 29th May 1912, as amended by this Department Notification No. 88 of the 20th June 1912.

No. 181.—On return from leave, Mr. A B. Nixon, Assistant Conservator of Forests, is attached to the Pyinmana Forest Division.

No. 182.—(CORRIGENDUM).—In this Department Notification No. 158 of the 26th September 1912 *for* "308 (*b*)" *read* "338."

TIMBER AND PRODUCE RATES.

C. LEARY & CO.'S LONDON MARKET REPORT.

1st to 30th September 1912.

EAST INDIA TEAK.—*Timber.*—There has been somewhat more activity in Burma and Siam wood, and prices continue very firm. The outlook, even with an average output in the coming season, is very much in shippers' favour. Java is only a small market. *Planks.*—Very little business is doing in Java, as the quantities available are small, but the older descriptions have been in better request at full rates. The arrivals of Timber: were 525 loads from Burma, 37 loads from Bangkok and 6 loads from Java. Quotations are: Timber, £14 to £25 (Java £7 to £20); Flitches, £16 to £24 (Hewn Java £10 to £17); Planks, £14 to £25; (Java (£12 to £16);—all per load on c. i. f. terms. The analysis of deliveries and stocks is as follows:—

	Deliveries for September. Loads.		Deliveries to 30th September. Loads.		Dock Stock. Loads.	
	Timber.	*Planks.*	*Timber.*	*Planks.*	*Timber.*	*Planks.*
1912 ...	1,020	452	4,016	3,260	1,588	2,787
1911 ...	277	281	2,052	2,612	4,401	3,356
1910 ...	184	387	2,514	2,624	1,691	2,901

PADOUK.—The stock is quite sufficient for the limited demand.

PENCIL CEDAR.—Large logs of good quality are wanted; values of such are about 3*s.* upwards per calliper foot.

SATINWOOD.—East India.—Stocks are now considerable and the tone is dull, so that sales are difficult at shippers' present ideas of value. Quotations in parcel are 6*d.* to 1*s.* 6*d.* per foot for East India.

ROSEWOOD.—East India.—With the present large stock, only imports of sizeable wood are advisable; quotations are £7 to £15 per ton.

EBONY.—Ceylon.—There is a favourable opening for small shipments of average character. East India.—Logs of good quality would yield fair rates. Quotations are: Ceylon £7 to £15 per ton, East India £6 to £12.

MARKET RATES FOR FOREST PRODUCTS.

Name of Product.	Quotations, English or Indian.	Rates for September 1912.	Rates for October 1912.
Cardamoms ...	English, per lb.	...	3*s.* 9*d.* to 5*s.* 8*d.*
Croton Seeds ...	,, ,, cwt.	...	70*s.* to 80*s.*
Cutch ...	,, ,, ,,	29*s.* to 35*s.*	29*s.* to 35*s.*
,, (Tablets) ...	Burma ,, ,,	Rs. 53 to Rs. 55.	Rs. 55.
Gum, Arabic—			
Karachi ...	English ,, ,,	...	27*s.* 6*d.* to 35*s.*
Madras ...	,, ,, ,,	...	27*s.* 6*d.* to 35*s.*
Gum, Kino ...	,, ,, lb.	...	6*d.* to 1*s.* 5*d.*
Myrabolans—			
Bengal ...	,, ,, cwt.	...	4*s.* to 5*s.*
Bombay ...	,, ,, ,,	...	4*s.* 6*d.* to 7*s.* 3*d.*
Madras ...	,, ,, ,,	...	4*s.* 9*d.* to 5*s.* 6*d.*
Myrabolans ...	Indian, per B. Md.	Not quoted.	Rs. 2-6.
Nux Vomica—			
Bengal ...	English, per cwt.	...	9*s.*
Madras ...	,, ,, ,,	...	9*s.* to 9*s.* 6*d.*
Cochin ...	,, ,, ,,	...	9*s.* 6*d.* to 12*s.* 6*d.*
Nux Vomica ...	Indian, per B. Md.	Rs. 2-14 to Rs. 3-6.	Rs 3 to Rs. 3-6.
Oil, Lemon Grass ...	,, per oz.	Not quoted.	4*d.*
,, Rosha Grass ...	,, ,, lb.	Season closed.	Rs.5-6-9 to Rs.6-0-5.
,, Sandalwood ...	English ,, lb.	...	12*s.* 6*d.*
Rosin ...	,, ,, cwt.	16*s.* 4½*d.* to 16*s.* 9*d.*	16*s.* 4½*d.* to 16*s.* 6*d.*
,, Calcutta ...	Indian ,, ,,	Rs. 15-8 to Rs. 16.	Rs. 15-8 to Rs. 16.
,, Bombay, "F" Grade.	,, ,, ,,	Rs. 13-8 to Rs. 14-4.	Rs. 13-4 to Rs. 13-12.
Turpentine ...	English, ,, gall.	2*s.* 4*d.* to 2*s.* 5*d.*	2*s.* 4*d*
,, Bombay...	Indian ,, ,,	Rs. 3-2-9 to Rs. 3-4-4.	Rs. 3-3 to Rs. 3-3-2.
,, Calcutta (Weight Brand).	,, ,, ,,	...	Re. 1-7 to 1-10.
Rubber, India—			
Assam ...	Indian, per B. Md.	Rs. 60 to Rs. 140.	Rs. 50 to Rs. 140.
,, ...	English, per lb.	...	3*s.* 10*d.*
Burma ...	,, ,, ,,	...	2*s.* to 3*s.* 7½*d.*
Rubber, Para ...	,, ,, ,,	4*s.* 5¾*d.* to 5*s.*	4*s.* 2½*d.* to 4*s.* 7*d.*
Seed-lac ...	,, ,, cwt.	...	55*s.* to 65*s.*
Shellac, T.N Diamond	Indian, per B. Md.	Rs. 31-8 to Rs. 33.	Rs. 34 to Rs. 35-8.
,, T.N. Orange	English per cwt.	65*s.* to 68*s.*	68*s.* to 70*s.* 6*d.*
Tamarinds—			
Calcutta ...	,, ,, ,,	...	9*s.* to 12*s.*
Madras ...	,, ,, ,,	...	4*s.* to 5*s.*
Tamarinds ...	Indian, per B. Md.	Re. 1-6 to Rs. 4-4.	Re. 1-6 to Rs. 4-4.
Teak (Selected 1st class).	Indian, per ton of 50 c.ft.	Rs. 125 to Rs. 140.	Rs. 125 to Rs. 140.

Note.—(1) B. Md. indicates Bengal Maund, which is equal to 80 lbs.

(2) T. N. in Diamond and T. N. Orange are commercial terms applied to certain grades of shellac.

LIST OF BOOKS AND PUBLICATIONS RECEIVED BY HONORARY EDITOR DURING OCTOBER 1912.

Revue des Eaux et Forêts, No. 18, for September 1912.

American Forestry for September 1912.

Indian Trade Journal for October 3rd, 10th, 17th and 24th.

Indian Field.

Tropical Agriculturist for September and October 1912.

Indian Engineering for September 28th and October 5th, 12th, 19th and 26th.

Commercial America for September 1912.

Memoirs of the Department of Agriculture in India :—The Big Brown Cricket, Vol. IV, No. 3.

Third Report on the Introduction of Improvements into Agriculture by the Work of the Agricultural Department.

Department of Interior Canada :—Forest Products of Canada ; Report on Timber Conditions Around Lesser Slave Lake, 1910, Bull. Nos. 28 and 29.

The Cultivation of Lac in the Plains of India *(Tachardia lacca, Kerr)* ; Directions of the Cultivation of Eri Silk, Bull. Nos. 28 and 29.

Punjab Forest Administration Report for 1911-12.

Die Naturliche Verjungung des Djati *Tectona grandis.*

Indian and Eastern Engineer for October 1912.

India Rubber World for October 1912.

Bulletin Economique de L'Indochine, No. 97.

Forestry Quarterly, Vol. X, No. 3.

Land Records Administration Report of Burma, 30th June 1912.

Bulletin of the Bureau of Agricultural Intelligence and of Plant Diseases, No. 9, for September 1912.

Quarterly Journal of Forestry for October 1912.

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